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MARS SURVEYOR OPERATIONS PROJECT

READINESS REVIEW - PART I DAY 2

August 26-27, 1998

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California



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JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA



AGENDA

Thursday, August 27, 1998

8:00	Operations Test and Training Overview	Brower
8:15	Spacecraft Team Readiness Readiness for MGS A/B 2 Readiness for MCO, MPL	Neuman Starnes Dukes
10:15	Navigation Team Readiness	Esposito
11:45	Lunch	
12:45	Mission Planning and Sequence Team	Brooks
1:15	Science Office	Thorpe
1:45	MGS Special Topic: HGA Deployment Issues	Whetsel
2:30	Risk Assessment	Whetsel
3:00	Summary of Open Issues	Cunningham
3:15	Readiness Statement	Cunningham
3:20	Board Meeting	Ploszaj

GEC-2

MSOP Readiness Review: Part I

8/26-27/98



AGENDA

Friday, October 30, 1998

		•		
	8:00	Welcome, Introduction, Scope of Today's Review	Cunningham	
	8:10	Closure of Previous Open Issues	Cunningham	
	9:15	MCO, MPL Status Update	Thurman	
	9:30	MOS Compatibility Testing and Validation for '98	Whetsel, Lop	ez
	10:30	Mission Development and Support	Theisinger, Lo	opez, et al
	12:00	Lunch		
	1:00	Science Facility Readiness	Thorpe, et al	
	1:30	Operations Test and Training for '98	Brower	
	2:45	MSOP Launch / Hold Criteria	Whetsel	
	3:00	Media Relations and Outreach	Cunningham,	Goodall
	3:15	Summary of Open Issues	Cunningham	
	3:30	Readiness Statement	Cunningham	
M	3:35 SOP Readiness	Board Meeting Review: Part I	Ploszaj	GEC-3 8/26-27/98



OPERATIONS TEST AND TRAINING OVERVIEW FOR MGS

G. BROWER



AGENDA

- OBJECTIVE
- · SCOPE
- RESULTS



OBJECTIVES

- PROVIDE INDIVIDUALS MATRIX TO GAIN THE KNOWLEDGE AND THE SKILLS TO PERFORM SPECIFIC OPERATIONAL TASKS DURING AEROBRAKING
- PROVIDE VALIDATION AND EXECUTION OF PROCEDURES
- PROVIDE REHEARSAL OF TEAM INTERFACES AND PROCEDURES



OBJECTIVES

- VERIFY MECHANISMS IN PLACE REQUIRED TO COLLECT, PREPARE, AND DISTRIBUTE THE DATA TO SUPPORT AEROBRAKING
- VALIDATE PROCESSES AND COORDINATION REQUIRED TO PLAN, GENERATE, AND RADIATE COMMANDS
- VALIDATE PROCEDURES, TOOLS AND INTERFACES REQUIRED TO IDENTIFY, ANALYZE, AND CORRECT SPACECRAFT PROBLEMS



SCOPE

- TABLE TOP WALK THROUGH AND STL RUN FOR ORT EXERCISES
 - Nominal 1.9 hour Orbit Operations (Walk-Through Only)
 - ·Timeline for 4 drag sequence uplinks per day will be addressed
 - Meeting Times
 - Expected data delivery times
 - Sequence build strategy
 - Anomalous 1.9 Hour Orbit Operations
 - Include an unplanned Immediate Action ABM
 - Include new procedure capability to build drag sequences by applying Periapsis timing adjustment to an OPTG file
 - Contingency Mode Entry and Recovery
 - Includes a pop-up maneuver to leave atmosphere
 - Pop-up maneuver will utilize the anti-sun burn strategy
 - •Exercise will include S/C reconfiguration to wheel control and ANS
 - Ongoing SPO Flight Operations ongoing during exercises



RESULTS

- RESULTS FROM TABLE TOP WALK THROUGH (Summery)
 - New APG form in development for Aerobraking Phase 2
 - SCT/SEQ teams discussions on C-mode naming and memory location conventions.
 - SCT to look on what other clean-up items may be required for post C-mode and post Pop-up configurations
 - Variable Magnitude Anti-Sun Pop-up Options
 - Nav investigating the need for a Seq timing offset table for sequences follow an immediate action burn



RESULTS

- RESULTS OF ORT USING THE STL (Summery)
 - Review and Update Products to Include C-mode and Pop-up Sequences
 - Procedures
 - Supporting S/W Tools
 - Identified the inability of the ASP to read 4 Digit Orbit numbers
 - Starting Sequence Memory address being over written
 - Corrected during exercise
 - Identified a few Updates to ABGEN for Aerobraking
 - Sequence Timing offset
 - Updates that would aid in limiting the number of hand edits
 - Correction to how sequences are merged
 - Identified S/C DMD window identification process is needed to distinguish multiple S/C
 - ORT Very Successful



ORT Action Items

DESCRIPTION	RESOLUTION
Need the latest and greatest APG form from Dan Johnston.	Closed.
Uplinking the real P and W-sequences to the spacecraft caused an early delay.	Observation only. No action.
There were too many OPTG files on the system to determine which one was correct. As a result, the	
first A1291 build used the wrong one and had to be re-built.	Problem only for ORT. No action.
There were too many digits on the OPTG/SPK filenames for the ORT.	Problem only for ORT. No action.
The A1291 sequence was built for ID 95, but the burn quaternion CVF was previously generated for	
ID 94 since it is a final uplinkable version.	Problem only for ORT. No action.
The planetary ephemeris and star catalogs needed to be built by AACS during the ORT. During	
normal ops, these would have been previously built.	Problem only for ORT. No action.
POST_BURN_QUAT should have been ignored since the ABM post slew option was set to false but	
it wasn't.	Sidney (8/25) awaiting MCR
The A1291 had a bad time on the WINDOW directive.	Closed to FR
AACS_PEF_STRIP needs to be updated to handle four digits, and linked to the aerobraking version.	Closed.
The ABM sequence review procedure for AACS needs updated to include new verifications such as	
	Closed.
Telecom wondered if there was a better recorder than 1A to record the ABM data since it will get	
overwritten by the next drag record. Having it on another recorder would allow later playback during	
contingencies.	No action.
There was a missing SEQEND in the merged A1291 PEF. The ABM portion had a SEQEND and	
the P1289 PEF which was merged in had a SEQEND, but when the merged PEF came out, the P1289	
SEQEND was missing.	Mainland (8/21) - awaiting MCR for SEQGEN
auto_scum need to be updated for the new SOE format and the new buffer maps.	Closed.
Scoreboard number for P1293a was 0, and the previous number was also 0. Normally this cycles	
from 0 to 3 and then back to 0.	Closed.
Fix QUATGEN to use same parameter names as Wayne's parameter list, and then auto_print the	C11
procedure.	Closed.
Re-group the weekly reset parameters so they are easier to read by subsystem.	Closed.
P1295a drag sequence did not contain the desired 180 second offset - presumed ABGEN problem	Closed.
P1295a drag sequence loaded into the same starting memory address as P1293a and had the same	
CSNs (including scoreboard number). Later discovered ASP process could not handle 4 digit orbit	Closed.
numbers in the file names, therefore incorrect fincon file in	Closed.
Are there more products from the SCT to APG expected for the meeting? Other than the draggen output?	Closed.
QUATGEN needs to update the .merge file when a timing offset is used.	Closed.
P1293a did not have a stop script command. SOE commands for aerobrake block are off by 12 minutes.	Mainland (8/21) - awaiting MCR for SEQGEN Closed.
	Closed.
Nominal drag sequence needs to disable thermal REDMAN during the time when DTC heaters are turned off.	Closed to FR
	Closed to FR
All DMD plots should have SC ID and TIS #.	Ciosea



ORT Action Items

DESCRIPTION	RESOLUTION
TWTA-2 was still on after AEM script executed the first time.	Was re-built and tested. Closed.
We need to add the number of orbits for the c-mode drag sequence to the weekly reset parameters.	Closed
AEM script had commands for manual solar panel targets rather than c-mode targets.	Was re-built and tested. Closed.
Wrong OPTG was used for the P1292 build.	Operator error. Closed.
Sim_clock problem in STL forced a restart.	STL glitch. Closed.
Bad SEQTRAN directive in P1292 sequence should have been a setter command. (How did this work last time we ran it?)	Closed to FR
V/T-8 was selected when V/T-7 was expected, probably due to overtemp condition. (This may be a function of STL temperature data.) Command to V/T-3 was issued to help debug this.	STL glitch. Closed.
We forgot the SAGSSI & SCRSCC commands in the P1292 sequence as described by the c-mode procedure. These commands were hand issued in the STL.	Sidney to consider automating these commands to eliminate editing errors and to decrease build time (8/25) awaiting MCR
Wrong STL decom map was loaded and 10 bps data could not be obtained. (Later, the correct map was loaded and 10 bps data was received and verified to be nominal.)	Closed.
STL went into C-mode during the P1293 drag pass. (This appeared to be an STL glitch since the audit queue showed multiple hardware errors like SAP write and SAP read errors.)	STL glitch. Closed.
Star crossings were not received in the STL during the sun'star'init period after c-mode had been tripped. Later, after restarting after the STL glitch, the star crossing worked fine.	STL glitch. Closed.
POPUP needs to add a dot product optimization code.	Closed.
The POPUP procedure needs to be updated to disable STAREX prior to POPUP build, and to use post-starex-disable data to verify the burn quaternion prior to uplinking the sequence.	Hogen (8/25)
The c-mode procedure calls for copying the backup parameters into the primary parameters which doesn't work with the TACH HOLD parameter. (Is it possible to run just backup orbits.)	Closed.
SEQGEN could not be used to edit the nominal drag SASF. This was because the we needed to use the test bed version.	ORT only. Closed.
P1295d sequence had commands prior to the start of the sequence. This was because the hand edited times for the telecom commands were off by a year.	Sidney to consider automating these commands to eliminate editing errors and to decrease build time (8/25)
There were many telecom hand edits necessary to return to nominal operations. Maybe it would be better to recover to 10 bps and then send a load & go later to get 2K.	Sidney to consider automating these commands to eliminate editing errors and to decrease build time (8/25)
All subsystems procedures need to include PEF review steps for c-mode drag sequence and popup sequence.	Closed.
auto_scum needs to flag error message if stop script command is missing from a P-sequence, and needs to adjust the first command time accordingly.	Closed.
P1295d did not have a stop script command. (Also, P1293a from ORT Script #2 also did not contain one.)	S. Wissler awaiting MCR for send frf script
P1295d did not disable the AEM script.	Sidney (8/25) awaiting MCR
POPUP bombed on 10 bps data.	ORT only. Closed.



Spacecraft Team Concurrent Flight Operations

Jim Neuman



Topics

- Approach
- Personnel
- Hardware
- Logistics
- · Schedule



Concurrent Operations Approach

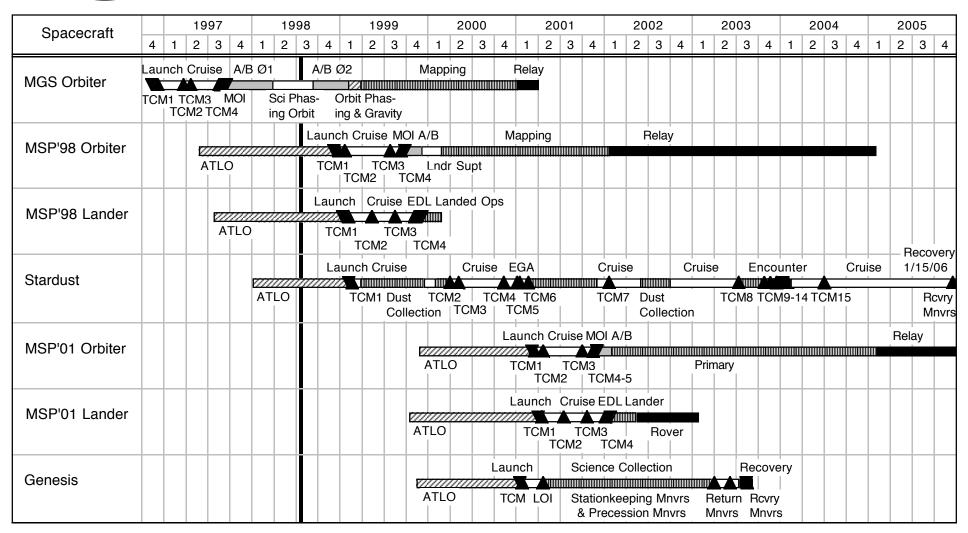


Concurrent Operations Approach

- One Spacecraft Team
 - Made Up of Experts in Systems Engineering and Subsystems Technical Disciplines
 - Designed, Built, and Tested the 4 Spacecraft In Operation
 - Personnel Are Identified and Currently Supporting ATLO and Mission Ops Development Tasks
- One Mission Support Area
 - Co-Located Monitor & Control Workstations, Offices, Conference Room, Library, and Spacecraft Test Lab
 - Test Control Centers Serve as Launch Support "Back Rooms"
 - Can Launch Any Day of Launch Windows Independent Personnel
- One Ground Data System
 - Commonality with Test Control Centers
 - 3 Mbps Data Bandwidth Plus JPL Digital Voice Network
- One Set of Processes Which Recognize S/C-Unique Aspects
- Flight Systems Product Development Organization (PDO)
 Provides Source of Additional Experienced Technical Experts
 for Critical Flight Activities and Anomaly Resolution



Flight Timelines





Personnel



Systems / Realtime Ops

- All Systems Engineers Support All Spacecraft
- Prime Responsibility for Each Spacecraft Placed on One Systems Engineer ("Spacecraft Engineer")
 - Contributed to Design and Supported ATLO for That Spacecraft
 - Ensures Cognizant Engineer Is Always Anticipating That Spacecraft's Requirements
 - Spacecraft Engineer Performs Normal Systems Activities for All Spacecraft in "Spare" Time
- Systems Engineers Responsible for:
 - Integration of Subsystems Activities, Reviews, and Planning
 - Integrated Sequence and Command Preparation in Cooperation with Sequence Engineers
 - Realtime Operations (ACE Function)
 - STL Testing



Subsystems

- All Subsystems Engineers Support All Spacecraft in Their Respective Discipline
 - Evolutionary Cross-Training with Other Spacecraft
 - Evolutionary Cross-Training with Similar Disciplines
 - Power / Thermal
 - AACS / Propulsion
 - FSW / C&DH
 - Telecom / ACE
- Technical Experts for Each Subsystem
 - Contributed to Design and Supported ATLO for That Spacecraft
 - Spacecraft Similarities Enable Fewer Than One Engineer Per Subsystem per Spacecraft => Lower Cost Operations
- Subsystems Engineers Responsible for:
 - Health and Safety of Their Respective Subsystems
 - Predictions of Future Performance
 - Sequence and Command Input Preparation
 - STL Test Support

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Management and Support

- One Full-Time Team Chief for All Spacecraft
- One Full-Time LMA Manager
 - Serves as MSOP Program Manager
 - Handles Routine MGS, MSP98, and Stardust Program Manager Duties
 - Bud McAnally, Ed Euler, and Joe Vellinga Provide Part-Time Program
 Management for Their Respective Development Programs
 - Serves as Mission Ops Product Development Organization Manager
 - Serves as Stardust Flight Ops Manager
 - Serves as Deputy Mars Flight Ops Manager
 - Supports Future Mission Development
- One Part-Time Contracts Support Person for Both Programs
- One Part-Time Finance Support Person for Both Programs
- One Part-Time Secretary for Both Programs
- One Part-Time Planner for Both Programs



Anomaly Resources

Personnel

- Flight Systems Product Development Organization (PDO) Provides Source of Cognizant Engineers Who Developed MGS, MSP'98, & Stardust
 - Avionics (C&DH, Power)
 - · GN&C (AACS)
 - Mission Ops

- Flight Software and EGSE
- Telecom
- Mechanisms
- Mechanical (Structures, Stress, Dynamics, Thermal)
- Development Group Within Mission Ops PDO
 - Developed Telemetry and Command Ground Systems During ATLO
 - Developing Similar Systems for Future Spacecraft
- LMA Home Shops

Funding

- MSOP Contract Provides Anomaly Pool Under Technical Direction Memorandum (TDM) Control
 - · Can Be Issued Within a Few Hours of Anomaly Occurrence
 - Has Been Invoked for Three MGS Anomalies
- Stardust Contractual Vehicle TBD -- Proposing Similar Arrangement

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Hardware / Logistics



Infrastructure

- All Spacecraft Use Existing MSA
 - Completed Upgrade of GFP Workstations and Operating System to Handle Multiple Data Streams
 - Capacity Sized for 5 Spacecraft
 - Exceptions: Only 3 STLs for 4 Spacecraft, and Only 2 ACE Stations
 Planned
 - Typically Display Data for One to Two Spacecraft Simultaneously
 - Only Communicate with One MSP Spacecraft at a Time
- Alarm Checking for All Spacecraft in Background with Pop-Up Windows for Less Active Spacecraft
 - Upgrading Pager System to Add Spacecraft ID
- All Spacecraft Use Existing Complement of VOCA Stations
- High Bandwidth Connections to JPL
 - Two (Plus One Backup) Diversely Routed GFP T-1 Data Lines
 - Two GFP T-1 Voice Lines
 - One LMA-Leased T-1 Administrative Line



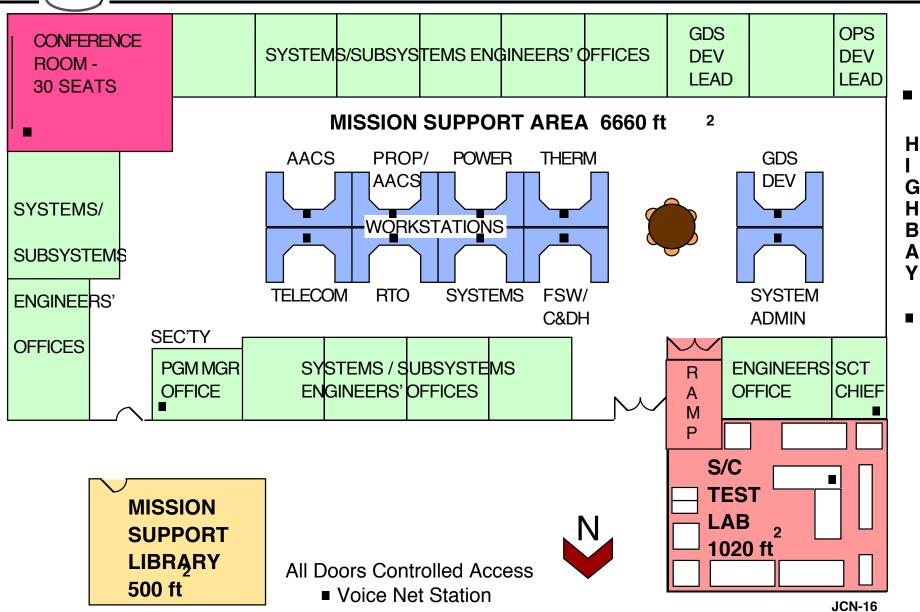
Facilities

- One STL per Program in MSA
 - MCO and MPL Share One STL
 - MGS and Stardust Have Dedicated STLs
 - STL Move to MSA Postponed Until After Launches to Accommodate FSW Testing
- MSA Uninterruptible Power Supply
 - Request Submitted for Installation by Orbiter Launch
 - Individual UPS with ~10 Minute Capability in Place for Critical Workstations
- MSA Reconfiguration from 6 Ops Bays and 4 Development Bays to 8 Ops Bays and 2 Development Bays
 - Provide Space for Simultaneous ACE Activities
 - Provide Space for Larger Power & Thermal Groups
 - Request Submitted for Reconfiguration by Orbiter Launch

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Mission Support Area Layout



MSOP Readiness Review: Part I

8/26-27/98



Coordination

Meetings

- One Weekly Plans and Status Meeting Involving All Spacecraft
 - Special Mars Aerobraking Planning Group Meeting and Weekly Reset Meeting for MGS/MCO Aerobraking Only
- Separate Weekly Change Board Meeting and Weekly Project Staff Meeting for MSOP and Stardust
 - SCT Will Involve Same Personnel
- Separate Weekly Command Approval Meeting for MSOP and Stardust
- Twice-Weekly SCT Meetings Involving All Spacecraft
- "Meet-Me" Phone Lines to Allow All Project Elements to Easily Participate in Any Meeting

Data

- Project Data Base on Flight LAN for Critical Data Exchange
 - Sequencing Products, Nav Products, etc
 - Controlled by Spacecraft ID
- Servers on Admin LAN for Non-Critical Data Exchange
 - Presentations, Administrative Data, Logs, etc
 - Collab Server: Each Side Replicates Other Side Every Half Hour

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Integrated Schedule



Spacecraft Team Readiness for Phase 2 Aerobraking

K. Starnes



Phase 1 Lessons Learned

- Workshop Held 6/9/98
- Driving Differences for Phase 2
 - Shorter Orbit Periods
 - Eclipse
 - Aphelion
 - Expecting Smoother Atmosphere
 - Trends Will Require Mostly Up ABMs
- Valuable Lessons From Phase 1
 - Strive for Only One Sequence Build Per Day
 - Systems, RTO, AACS and SCUM Required for Sequence Builds. Others Required for Weekly Reset.
 - Provide 12 Hours Worth of Backup Orbits in Sequence.
 - Science Sequence Management Difficult When Multi Prime Orbits Used.
 - Corridor Control ABMs (Planned) Can Be Built on Prime Shift.
 - Processes Threatened by Comm Outages and ASP Troubles.



Changes for Aerobraking Phase 2

- ABM Decision Making Weekly Predicted Maneuvers Did Not Work.
 - Re-Introduce the Dynamic Pressure Running Mean As Criterion for ABMs.
 - Target No More Than 1 ABM Build Per Day, Prime Shift.
- Install Updated ASP (Automated Sequence Processor) at LMA, Train.
- Further Training
 - STL Operators
 - ABGEN Internals
- Check Out Emergency Control Center (ECC) Procedure for Use.
- Command S/C to C'Mode If Sequence Allowed to Run Out



Changes for Aerobraking Phase 2 (cont.)

- Host DRAGGEN on Faster Machine for Quicker SAM Health Assessment.
- Continue With One Drag Sequence Build per Day.
 - Only Systems and RTO On 24/7 Initially.
 - AACS, SCUM Transition to 24/7 When Multi Builds per Day Required.
 - Unexpected Drag Sequence Builds Off Shift.
 - Call in AACS and SCUM
 - Target Earliest Orbit Based on 4 Hour Turnaround.
- Thermal, Power and Telecom Support 24/7 in Walkout as Required.
- Designate 1 Orbit per Day as ABM Opportunity
 - Maneuver Should Execute Near End of Primary Orbits to Reduce Sequence Timing Impact
 - Immediate Action ABMs Can Occur on Any Orbit
 - Maintain ABMs Size Selection Capability



SCT Action Items / Status

- 1) Can the 225 s Periapsis Timing Requirement Be Relaxed?
 - Closed. Table of New Timing Requirements Increases
 Allowance From 232s to 281s as a Function of Orbit Period.
- 2) Compile List of File Access and Connectivity Problems Encountered in Phase 1 AB.
 - Closed. List of 6 Items Delivered to Sequence Team
- 6&7) Assess Means of Generating OPTG/SPK Files if Post Periapsis Tracking Data is Unavailable, Test Method or S/W
 - Closed. Method of Determining Delta V Delivered to Nav Team for Process.
- 8) Increase Stored Sequence Buffer to Accommodate At Least 18 Orbits.
 - Closed. MCR 261. SEQTRAN Ready for Installation.



SCT Action Items / Status (cont.)

- 10) Define Phase 2 Dynamic Pressure Corridor Limits for Flight Profile Design.
 - Closed. See Johnston Presentation.
- 11) Define Operations Corridor Control Strategy
 - Closed, See Johnston Presentation.
- 12) Write Procedures for Responding to Communications Outages.
 - In Work. New Remote Switch and 3rd Diversely Routed T-1 Line Tested on 8/24? Complete Item on 9/15.
- 17) Provide Trending Plots of Dynamic Pressure for APG Mtgs.
 - Closed. Plots Will be Included in SCT Daily Package.
- 19) Identify "Standardized" Inputs for APG Mtgs.
 - Closed. Includes Items from Phase 1 Plus DP Trending Plots and AACS Estimated Periapsis Timing Errors.



System Implementations

- ABGEN and SEQGEN Impacts MCR-260, MCR-262
 - Add Panel Position for Power Eclipse Season
 - Add Heater Management Capability
 - Add Pre-Drag Starex Disable
 - Add Sun Angle Error Persistence Threshold Parameter
 - Add Option to ABM Block to Allow Post ABM ISH
 - Incorporate a "GO-C'MODE" Command at End of Sequence
 - Delete Science Sequence, Incorporate Science Data Return
 Commands Into the Drag Pass Sequence
 - Add Capability to Generate C'Mode Drag Sequence That Alternately Commands to Wheels and Thrusters
 - Add Capability to Generate a "POPUP" ABM, Using Anti-Sun Quaternion, Executed From Sun'Star'Init Mode.



System Implementations (cont.)

- SEQTRAN Impacts MCR-261
 - Increase Drag Sequence Buffer Size to Allow For About 18
 Orbit Sequence
- Impacts Resulting From Operational Readiness Tests Action Items
 - MCR-283 to Disable Thermal DTC Fault Protection When Heaters Are Powered Off. (ABGEN, SEQGEN)
 - MCR-XXX to Update ABGEN
 - Ignore POST_BURN_QUAT if ABM POST Slew Option is False
 - Add Command to Enable Normal Sequence Execution From C'Mode Drag Sequence
 - Disable AEM Script Execution from Nominal Sequences
 - Failure Reports to Document 5 Coding Errors in ABGEN
- C'Mode Script Update / AEM Script Development
- Flight Software Parameter Review (9/2/98)
- Complete STL Validation (8/28/98)



Attitude Control

Star Processing

- Pre-Drag Delay Was Added To Aerobraking Block For Phase-2
 Interference Problems
- MOLA/Power ISH During Endgame Overlaps Interference
 Period And Therefore Does Not Reduce Processing Window
- Star Catalog Density Is Adequate During Endgame

QUATGEN

- Verified To Fit Mapping Ephemeris For About Two Days
- Changes Have Been Made To Implement MOLA/Power ISH
- Ability To Handle A Timing Adjustment Has Been Tested

DRAGGEN

- Updated To Provide Dynamic Pressure Running Mean
- Updated To Provide Periapsis Timing Estimate



Attitude Control (Cont)

- Fuel Use
 - Fuel Savings Techniques Have Been Implemented
 - Simulations Show 10 grams/pass Is Achievable As Shown In Delta-V Budget
- Slew Durations Have Been Analyzed And Are Acceptable For Power
- Sun Avoidance During Phase-2 Up ABMs Is Not A Concern
- Anti-Sun Maneuvers
 - Program To Calculate Anti-Sun Burn Attitude From 10 bps Data Is Complete
 - Efficiency Is Very Good In Endgame (>70%)
- Early Termination Of Aerobraking
 - CSA Rate Constraints Have Been Identified
 - Gimbal Articulation Constraints Have Been Analyzed
 - Mapping Ephemeris Can Be Fit For Any Orbit Using Two-Piece Solution



Aerobraking (Nominal) - Power

- Energy Balance is the Key AB-2 Issue for the Power System
 - Flat Panels in ANS Generate 41% Less Power than Planned
 - Lower (Apoapsis) Sun Intensity Plus Larger (36° vs. 20°) EPS Angle
- Energy Balance Goes Negative for Orbits Below 2:20 h:mm
 - No Problem Before Eclipses Start
- Sequence Modifications Implemented to Achieve Positive Energy Balance
 - Load Control During Eclipse
 - Science Instruments to be Powered Down (MAG/ER, TES, KaBLE)
 - Heater Management
 - MOLA/Power ISH for 35 min. Following Drag
 - Optimized SA Angles for ANS
- Analyses Included 5% Load Growth, 2% SA Degradation
- ABM Orbits Run 34 WH Below Nominal Orbits



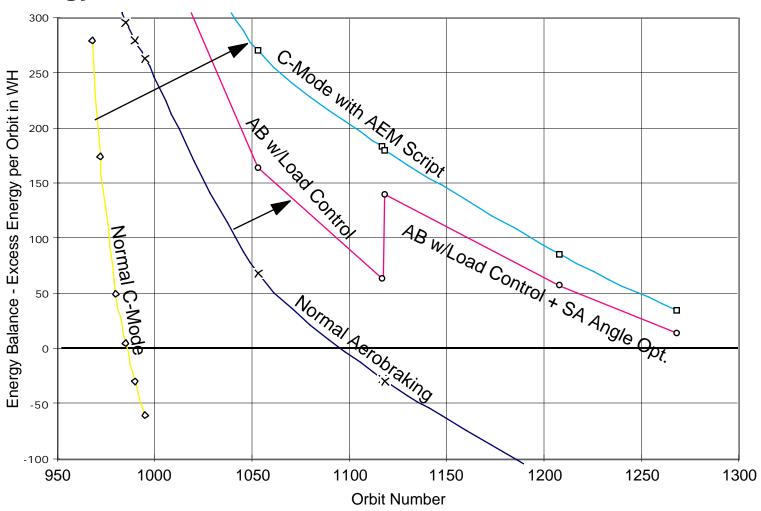
Aerobraking (Contingency) - Power

- C-Mode Panel Drag Angles Do Not Provide Adequate Energy During Short Orbits
 - Energy Balance Goes Negative 16 Orbits After Eclipses Start
 - Aphelion Sun Intensity is Down 32% From Original Plan
- AEM (Autonomous Engress Management) Script Implemented
 - Puts Panels in Sun-Normal Position After Drag
 - Returns Them to Drag Position at Eclipse Entry
 - Controls TWTA Off During Eclipse
 - Controls Heaters Off During Eclipse
- Safe Mode Has the Same Problem
 - Will be Disabled Just After Start of Eclipse



Energy Balance Summary Chart

 Sequence Changes are Required to Maintain Positive Energy Balance





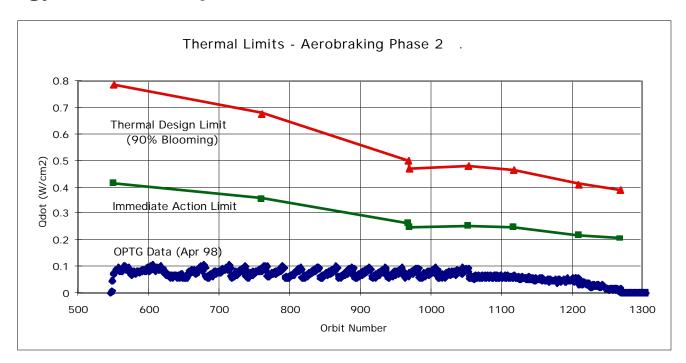
Summary - Power

- Changes Implemented Assure Adequate Energy
- Changes for Both Normal and C-Mode Verified in ORT
- Solar Array Performance Hanging In There
 - Negligible Degradation Since Analysis
- No Sign of PSA or Battery Degradation Since The Eclipse Season
 - PSA Requal, Cycle Life Test & DPA Completed 7/98
 - DPA Showed No Failures
 - Observed Degraded Pull Strength in Transistors as Expected
- Power Subsystem is Ready for AB-2 and Beyond



Aerobraking (Nominal) - Thermal

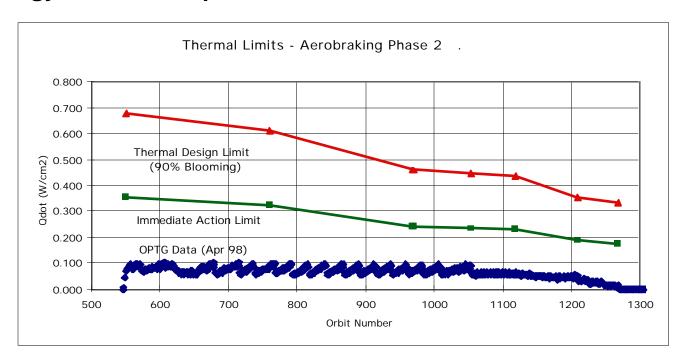
- Aeroheating Thermal Limits Are Not Restrictive
- Spacecraft Temperatures Are Within Design Limits
 - MOLA ISHs Will Be Required Throughout Phase 2 Aerobraking
 - ISH Durations Will Be Defined in the Weekly Reset Process
- Heater Management Implemented to Support Power Subsystem Energy Balance Requirements





Aerobraking (Contingency) - Thermal

- Aeroheating Thermal Limits Are Not Restrictive
 - However, Slightly More Restrictive Than Nominal
 - +X Body Sun Sensor Is Driving Component
- Spacecraft Temperatures Are Within Design Limits
 - MOLA Laser Temperature Maintained by Contingency Attitude
- Heater Management Implemented to Support Power Subsystem Energy Balance Requirements





Phase Two Uplink and Downlink Rates

- Uplink at 125 bps Over All Stations for Nominal Mode
 - Safe Mode Uplink (if needed) via HEF Stations Only
 - Return to Simultaneous Range and Command Modulation at BWG Stations Starting 12/01/98
- Downlink Rates up to 21,333.3 bps at Start of Phase 2
 - Maximum D/L Rate Increases to 85,333.3 bps by 02/09/99
- Earth Occultation Returns at 11/20/98
 - Maximum Duration of ~70 minutes in December (6-7 Hr Period)
 - Decreases to 40 Minutes by walkout (2 Hr Period)
- Solar Eclipse Season Starts 01/99
 - MOT Exciter will be Cycled to Save Power in Eclipse Season
 - In Contingency Mode TWTA Filament will also be Cycled by the Autonomous Eclipse Management Script



-Y Solar Array Structure

- No Discernible Degradation at End of Phase 1
- Steady State Panel Angle Checked on 7/7/98
 - No Change Since End of Phase 1
- No Other Direct Measurements of Panel Integrity During SPO



Staffing and Strategy

- Starting September 13, 1998 The RTO Begins 24 Hour Console Coverage. 5 Individuals Certified.
- The 24 Hour Monitoring Task to be Performed by RTO/ Systems Throughout Aerobraking. 8 Individuals 24/7
- AACS and Systems Provides 24 Hour Coverage Through the Walk-in Phase Then AACS Covers 24 Hours On-Call.
- Daily Drag Sequences are Built, Reviewed and Approved by Systems, RTO, AACS and SCUM.
- Daily APG MTGs Supported by Systems and SCUM.
- Up to 1 Corridor Control ABM Built and Executed per Day -Immediate Action ABMs Can be Generated at any Time.
- When Multi-Builds per Day Required, AACS and SCUM Transition to 24/7
- Walkout Operations Include Power, Telecom and Thermal Coverage 24/7 as Required



Staffing and Strategy (cont.)

- Complete Subsystem Staff Identified and Certified.
- RTO Shift Rotation Established, All ACEs Certified.
- Need 3 Additional Systems Engineers, May Fill From Other Subsystems Initially.

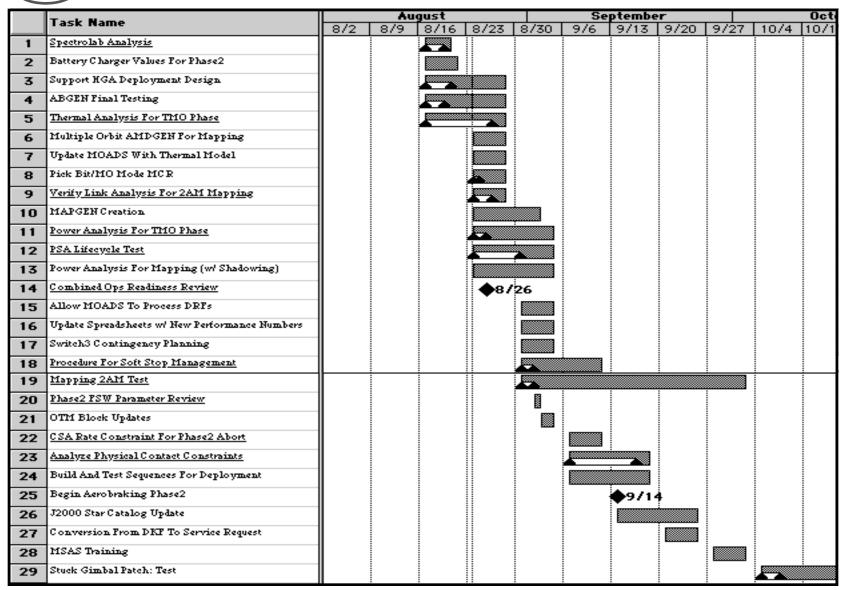


Testing and Validation

- STL Test and Verification of All Phase 2 Products -Complete or Underway (8/28/98)
 - Nominal 2-hour Aerobraking Drag Pass Sequence Validation
 - Nominal ABM Sequence Validation
 - Contingency Mode Drag Sequence / AEM Sequence Validation
 - Transition to Nominal OPs From C'Mode Sequence
 - Anti-Sun POPUP ABM Execution
- Operational Readiness Tests Completed 8/13
 - Minor Actions Taken to Correct Sequence Product Errors
 - Successful Simulation of 1.9-hour Aerobraking Operations



MGS Schedule





Concerns

- Completion of Mapping Preparation
 - Complete as Much as Possible Before Phase 2
 - Schedule During Longer Orbit Aerobraking
- Staffing
 - Certify More ACEs and Systems Engineers
 - To Minimize Effects of Long Shifts and Long Aerobraking Duration
 - To Prepare for MSP and Stardust Launches.



Spacecraft Team Readiness

- The Spacecraft Team is Prepared to Begin and Execute Phase 2 Aerobraking Through Accomplishment of the 2-Hour Mapping Orbit.
- "Friendly" Mars Atmosphere Will Help Assure Completion of Mapping Preparations.



MSP '98 Launch Readiness

Eileen Dukes



Processes

- As Much Commonality As Possible
- Functions Are the Same, Though Implementation May Differ
 - Processes Are Essentially Unchanged
 - More Detail in Procedure & OIA Sections of Presentation
- Major New Implementations
 - Commanding Interface & Config Files, On-Board Blocks
 - New Tools Required As a Result
 - Telemetry System No Longer Time Division Multiplexed (TDM)
 - Evolutionary Approach



Operations Interface Agreement (OIA)

- Document Team-to-Team Interfaces
- Half of the OIA's Required Minor or No Modification
- Half of the OIA's Are New to Cover New Interfaces
- All of the OIA's Needed for Launch Are Either Complete or In-Review
 - APGEN Model is Required for Landed Operations and is Still In-Work



Matrix Of OIA's

Number	Title	Type	SIS	STATUS
M98-SCT-001	Maneuver Performance Data File (MPDF)	Unchanged	Unchanged	Complete
M98-SCT-002	Maneuver Implementation File	Minor Modification	Unchanged	Complete
M98-SCT-003	SCT System Report	Minor Modification	Updated	In-Review
M98-SCT-005	Engineering Channel Parameter Table Update	New	New	In-Review
M98-SCT-006	Command Definition Language File	New	New	In-Review
M98-SCT-007	Message Header Files	New	New	In-Review
M98-SCT-009	Angular Momentum Desaturation (AMD) File	Minor Modification	Unchanged	Complete
M98-SCT-010	Small Forces File	New	New	In-Review

MSOP Readiness Review: Part I 8/26-27/98



Matrix of OIA's (Continued)

Title	Туре	SIS	STATUS
Spacecraft Solar Pressure Model	New	N/A	Complete
Spacecraft Aerodynamic Model	New	N/A	Complete
Spacecraft Clock Coefficient File	Unchanged	Unchanged	Complete
Real-Time Operations Log	Minor Modifications	N/A	In-Review
Mission Controller's Uplink Summary	New	N/A	In-Review
APGEN Model: Resource Envelope	New	New	In-Work
	Spacecraft Solar Pressure Model Spacecraft Aerodynamic Model Spacecraft Clock Coefficient File Real-Time Operations Log Mission Controller's Uplink Summary APGEN Model: Resource	Spacecraft Solar Pressure Model Spacecraft Aerodynamic Model Spacecraft Clock Coefficient File Real-Time Operations Log Mission Controller's Uplink Summary APGEN Model: Resource New New	Spacecraft Solar Pressure Model Spacecraft Aerodynamic Model Spacecraft Clock Coefficient File Real-Time Operations Log Mission Controller's Uplink Summary APGEN Model: Resource New N/A N/A N/A N/A N/A N/A N/A N/A



Procedures

- The Spacecraft Team (Including RTO & GDS) Has 76 Procedures Identified
 - 5 Are New
 - Due to the New FSW Architecture and the New AACS Design
 - 19 Require Minor Modification from MGS or Current Operations
 - 35 Require More Extensive Modification from MGS or Current Operations
 - Impact of New Spacecraft Design, New FSW Architecture, and New STL Design
 - 17 Require No Update
 - Primarily GDS Procedures Which Aren't Impacted by Spacecraft Design



Matrix of Spacecraft Team Procedures

M98-SCT-0001 Da M98-SCT-0002 Re	aily Health, Status and Reporting ed Alarm Limit Maintenance nomaly Response	SCT - All SCT - All	Minor Modification
M98-SCT-0002 Re	ed Alarm Limit Maintenance nomaly Response		
M98-SCT-0002 Re	ed Alarm Limit Maintenance nomaly Response	SCT - All	5.41 5.4 1161 (1)
M98-SCT-0003 An			Minor Modification
	•	SCT - All	Minor Modification
M98-SCT-0004 Ma	aneuver Design and Implementation	SCT - All	Minor Modification
M98-SCT-0005 MC	CO Launch Support & Initial Acquisition	SCT - All	Modified
	PL Launch Support & Initial Acquisition	SCT - All	Modified
M98-SCT-0008 Sp	pacecraft Parameter Tracking	SCT - All	Major Modification
M98-SCT-0010 Ac	ccessing the File Interchange System	SCT - All	Major Modification
	ored Sequence Generation and alidation	SCT - Systems	Minor Modification
	teractive Command Generation & alidation	SCT - Systems	Minor Modification
M98-SCT-0102 Into	teractive Payload Commanding	SCT - Systems	Modified
	rpress Command Generation & alidation	SCT - Systems	Minor Modification
M98-SCT-0104 Mis	ission Phase Bit Update	SCT - Systems	Major Modification
M98-SCT-0106 Gr	round Events Update	SCT - Systems	Minor Modification
M98-SCT-0201 AA	ACS Analysis and Trending	SCT - AACS	Modified
	ACS Slew Design & Att Profile eneration	SCT - AACS	Major Modification
M98-SCT-0203 AA	ACS Attitude Profile Gen (SCANGEN)	SCT - AACS	Major Modification
M98-SCT-0204 Mc	omentum Management	SCT - AACS	Major Modification
	phemeris Generation	SCT - AACS	Minor Modification
	ar Camera Performance Analysis &	SCT - AACS	NEW
M98-SCT-0208 Ma	ass Properties and Inertia Tracking	SCT - AACS	Modified



Matrix of Spacecraft Team Procedures (CONT)

M98-SCT-0301	C&DH Analysis and Trending	SCT - C&DH	Major Modification
M98-SCT-0403	FSW Modification, Test, and Uplink	SCT - FSW	Major Modification
M98-SCT-0404	Time Correlation	SCT - FSW	Minor Modification
M98-SCT-0405	Configuration File Update	SCT - FSW	NEW
M98-SCT-0406	Fault History Dump and Analysis	SCT - FSW	Major Modification of Audit Queue Dump
M98-SCT-0407	Command History Dump and Analysis	SCT-FSW	NEW
M98-SCT-0408	EVR Dump and Analysis	SCT-FSW	NEW
M98-SCT-0409	File System & Memory Tracking	SCT - FSW	NEW
M98-SCT-0501	Power Analysis and Trending	SCT - Power	Modified
M98-SCT-0502	Power Predictions	SCT - Power	Major Modification
M98-SCT-0503	V-T Curve Selection	SCT - Power	Modified
M98-SCT-0601	Prop Analysis and Trending	SCT - Prop	Modified
M98-SCT-0602	Prop Maneuver Prediction	SCT - Prop	Minor Modification
M98-SCT-0701	Telecom Analysis and Trending	SCT - Telecom	Modified
M98-SCT-0702	Telecom Link Predictions	SCT - Telecom	Modified
M98-SCT-0703	Telecom Best Lock Frequency Predictions	SCT - Telecom	Modified
M98-SCT-0801	Thermal Analysis & Trending	SCT - Thermal	Modified
M98-SCT-0802	Thermal Predictions	SCT - Thermal	Major Modification
SCT-0901	Ground Software Modification and Test	SCT - GDS	Not Impacted
SCT-0902	Workstation Configuration Management	SCT - GDS	Not Impacted
SCT-0903	SCT Data Management	SCT - GDS	Not Impacted
SCT-0904	General MSA Ops	SCT - GDS	Not Impacted
SCT-0905	MSA Computer Disk Backup/Restore	SCT - GDS	Not Impacted
SCT-0906	MSA Hardware Maintenance	SCT - GDS	Not Impacted
SCT-0907	MSA Power Up/Power Down	SCT - GDS	Not Impacted
SCT-0908	Voice Net Maintenance	SCT - GDS	Not Impacted



Matrix of Spacecraft Team Procedures (CONT)

SCT-1000	Cmd Approval	SCT - MGMT	Minor Modification
SCT-1001	Procedure CM	SCT - MGMT	Unchanged
SCT-1002	S/C Emerg Declaration	SCT - MGMT	Unchanged
SCT.RTO-0001	Daily Operations	SCT - RTO	Minor Modification
SCT.RTO-0002	Voice Net Communications	SCT - RTO	Minor Modification
SCT.RTO-0004	Critical Operations	SCT - RTO	Minor Modification
SCT.RTO-0005	Problem Detection / Notification / Analysis	SCT - RTO	Minor Modification
SCT.RTO-0006	Workstation Configuration	SCT - RTO	Unchanged
SCT.RTO-0007	Workstation Operation	SCT - RTO	Unchanged
SCT.RTO-0008	Workstation Problem Isolation / Recovery	SCT - RTO	Unchanged
SCT.RTO-0009	Updating and Re-configuring RTO Files	SCT - RTO	Unchanged
SCT.RTO-0010	Processing Commands	SCT - RTO	Minor Modification
SCT.RTO-0011	Product Archiving	SCT - RTO	Unchanged
SCT.RTO-0012	Command Verification	SCT - RTO	Modified
SCT.RTO-0013	Processing Decom Maps	SCT - RTO	Not Applicable
	STL System Shutdown	SCT - STL	Major Modification
M98-SCT.STL-0002		SCT - STL	Major Modification
	STL System Initialization	SCT - STL	Major Modification
M98-SCT.STL-0004			Minor Modification
	Simulation Set-up and Initialization	SCT - STL	Major Modification
M98-SCT.STL-0006	Op of STL - Seq Exec via Initialization	SCT - STL	Major Modification
	Op of STL - Seq Exec via Chckpt Restart	SCT - STL	Major Modification
	Post Processing of Telemetry Data	SCT - STL	Major Modification
M98-SCT.STL-0009	Memory Management	SCT - STL	Major Modification
	STL Software Maintenance	SCT - STL	Major Modification
M98-SCT.STL-0011	Raw Telemetry Log File Processing	SCT - STL	Major Modification
M98-SCT.STL-0014		SCT - STL	Minor Modification
M98-SCT.STL-0100	General STL Ops	SCT - STL	Minor Modification



Contingency Plans

- Contingency Plans Required for Launch and Early Cruise Have Been Identified
 - -One New Plan Required for the Emergency Control Center
 - -Six Other Plans Which Are Modified from MGS Plans

Number	PLAN	Туре
M98-SCT.CP-0001	Safe Mode Recovery	Major Modification
M98-SCT.CP-0003	Loss Of Signal	Modified
M98-SCT.CP-0003a	LOS - Initial Acquisition	Modified
M98-SCT.CP-0004	Emergency Control Center (ECC) Activation	NEW
M98-SCT.CP-0201	Failed Solar Array Deployment	Major Modification
M98-SCT.CP-0401	Failure to Acquire Inertial Reference	Major Modification
M98-SCT.CP-0601	Propulsion Anomaly	Modified



Sequence/Blocks

- On-Board Blocks Vs Ground Expanded Blocks (Gebs)
 - Expansion Still Required for Review and SOE/DKF Products
- All of the Primary Blocks & Sequences Have Been Executed on the S/C in a Sequence Verification Test
 - Safemode Blocks Are a Subset of Nominal Cmds and Will Be Delivered by 9/13
- Final Block Dictionaries to Capture As-Run
 - Orbiter: Event Tables to JPL- 8/28 Document Release 9/30
 - Lander: Event Tables to JPL 9/15 Document Release 10/27
- Final Command Dictionaries
 - CDL Files Are Current in the Ground Software
 - Orbiter: 10/15
 - Lander: 11/16
- Final Telemetry Dictionaries
 - CPT Files Are Current in the Ground Software
 - Orbiter 9/22
 - Lander 11/4



Subsystem Performance and Analysis Software

- Most Tools Have Same Interface As MGS
 - Procedures Only Require Minor Modification
- Some New (Unique) Tools E.G. Packet-Decom
 - Require New Procedure Development

Program	Туре	Status
ATT_PROFILE	Major Modification	9/1 Delivery
BURN_ATT_OPT	Minor Modification	Delivered
EPHEM_REFORMAT	Minor Modification	Delivered
SM_FORCES	Modified	Delivered
OBJECT_CRC	NEW	Delivered
PACKET_DECOM	NEW	9/1 Delivery
SCLK_SCET	Modified	9/1 Delivery
LOAD_PROFILE	Major Modification	9/1 Delivery



SPAS (CONT)

Program	Type	Status
POWER_PREDICT	NEW	9/1 Delivery
THERMAL_MODELING	Major Modification (TMG)	9/1 Delivery
TELECOM_MODELING	Modified	LIEN
QCK_TREND	Minor Modification	Delivered
VMPLOT	Minor Modification	Delivered



Flight Rules

- Final Flight Rules Document is Ready
 - Final Tabletops held 8/17 -18
 - Document Delivered to JPL 8/25
 - Official Document Release 8/31
- Minimum Set Coded in Ground Software Needed for Launch and Early Cruise
- Others Allocated to Block Design and Procedures



Training & certification

- Draft Training Plan In-Work
- Series of Briefings for Familiarization
 - Processes (Sequence Development, Mnvr Development, Etc)
 - Tools Use (Voice Net, DMD, Etc)
- Procedure Development
- Operations Readiness Training (ORT)
- Training Sheet for Each Person
 - Specialized by Function and S/C
 - Different Levels of Certification by S/C
- Approved by Lead & SCT Chief



Shift Schedules

- Continuous Coverage by All From L 24 Hrs Through L+48 Hrs
 - Lewis Lesson'S Learned
- Continuous (Within S/C Xmtr Limits) Coverage by a Subset (ACE, AACS, ?) Through TCM-1
 - Additional Expertise As Required Available From PDO
- Continuous ACE Coverage Through L+30
- Reduced to 8/5 for Rest of Cruise W/Automated Alarms and Web Pages



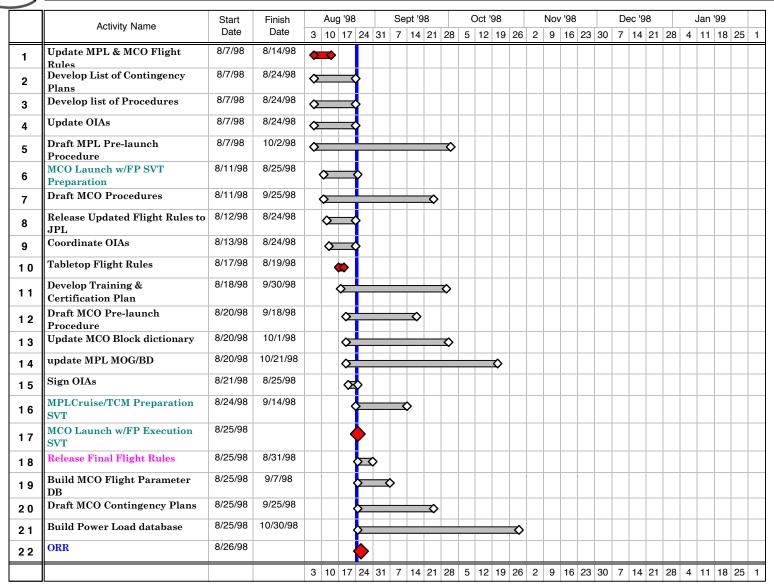
Realtime Ops Coverage

S/C	MISSION PHASE	COMMANDABILITY
MGS	Aerobraking	Continuous
	Mapping	8 Hours per Week (Average)
мсо	Launch	Continuous to L+30 Days
	Cruise & Mapping	12 Hours per Week (Average)
	MOI & Aerobraking	Continuous from MOI-2 Days
MPL	Launch	Continuous to L+30 Days
	Cruise	12 Hours per Week (Average)
	EDL	Continuous from EDL-45 Days ("Free" Due to MCO A/B)
	Landed Ops	10 Hours per Day
Stardust	Launch	Continuous to L+14 Days, Then 8 Hours/Day to L+30 Days
	Cruise	4 Hours per Week (Average)
	EGA, Encounter, & Return	Continuous for Event, Plus 8 Hours/Day for Event±~10 Days

- Plan Capability for 2 ACEs Operating Simultaneously
 - e.g., MGS Aerobraking and MCO Launch
- Deconflict Critical Activities to Maximum Extent Possible

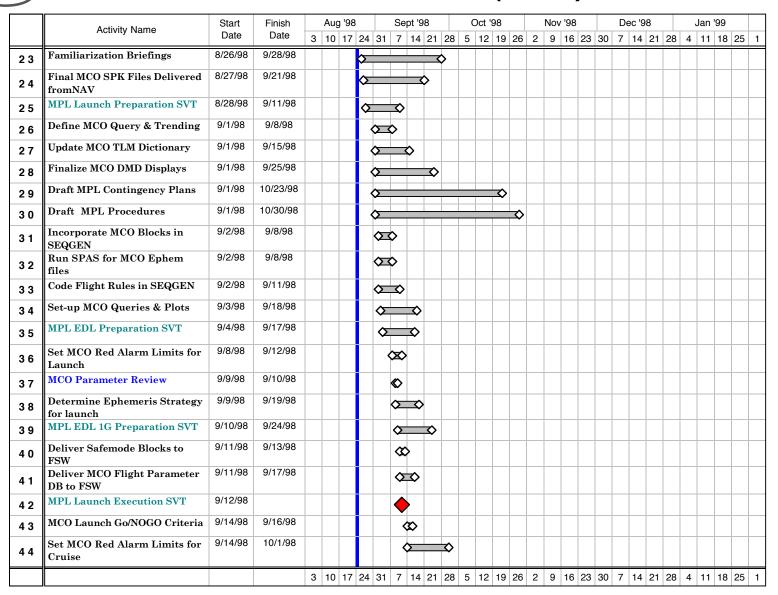


Overall Schedule





Overall Schedule (Cont)



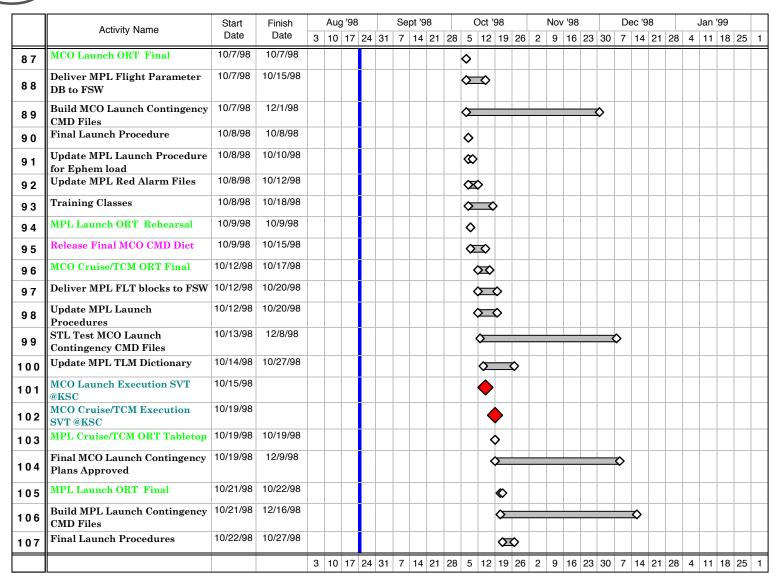


		Start	Finish		Aug	98' נ			Se	pt '9	8			Oct	'98			Nov	['] '98				Dec '	98			Jan	'99		
	Activity Name	Date	Date	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1
4 5	MPL Cruise/TCM Execution SVT	9/15/98							•	\																				
4 6	Define MPL Query & Trending	9/15/98	9/17/98							✡																				
4 7	Draft MCO Launch & Init Acq Procedure	9/15/98	9/21/98							✡	>																			
4 8	Finalize MPL DMD Displays	9/15/98	9/22/98							҉	>																			
4 9	Draft MPL Launch & Init Acq Procedure	9/15/98	10/9/98							़			\$																	
5 0	Release Final MCO TLM Dict	9/16/98	9/22/98							$\langle \Sigma \rangle$	>																			
5 1	Set-up MPL Queries & Plots	9/16/98	9/27/98							✡	=	>																		
5 2	MCO MOI Preparation SVT @KSC	9/16/98	9/30/98							፟		\$																		
5 3	MPL EDL Execution SVT	9/18/98																												
5 4	Update MCO Red Alarm Files	9/18/98	9/22/98							◊	>																			
5 5	Deliver MCO FLT blocks to FSW	9/20/98	9/24/98							<	×>																			
5 6	MCO Launch Execution SVT @KSC	9/21/98								•	>																			
5 7	MCO Launch ORT Tabletop	9/21/98	9/21/98							<	>																			
5 8	Build MPL Flight Parameter	9/21/98	10/2/98							<		\$																		
5 9	MCO Aerobraking Preparation SVT @KSC	9/21/98	10/4/98							<	\succ	_	>																	
6 0	MCO Cruise/TCM Execution SVT @KSC	9/22/98								•	>																			
6 1	Deliver MPL Blocks to JPL	9/22/98	9/23/98								✡																			
6 2	MCO Mapping Preparation SVT @KSC	9/22/98	10/6/98								҉		>																	
6 3	MPL Launch (no updates) Execution SVT	9/23/98									\																			
6 4	MCO Cruise/TCM ORT Tabletop	9/23/98	9/23/98								\																			
6 5	Update MCO Launch Procedure for Ephem load	9/23/98	9/25/98								✡																			
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6 6	Incorporate MPL Blocks in SEQGEN	9/23/98	9/28/98								Φ	\$																		
6 7	Draft MCO Launch Contingency Plan	9/23/98	10/3/98								Œ		>																	
6 8	Draft MPL Launch Contingency Plans	9/23/98	10/13/98								Œ			\$																
6 9	Set MPL Red Alarm Limits for Launch	9/24/98	9/30/98				Ī				Q	• \$																		
7 0	MPL EDL 1G Execution SVT	9/25/98					Ī				4																			
7 1	MCO Launch ORT Rehearsal	9/25/98	9/25/98								0	>																		
7 2	MCO Cruise/TCM ORT Rehearsal	9/28/98	10/3/98									∞	>																	
7 3	Update MCO Launch Procedures	9/28/98	10/6/98									✡	❖																	
7 4	Update MCO CMD Dictionary	9/28/98	10/8/98									\Diamond	❖																	
7 5	Execute MC O MOS-Compat	9/30/98	10/5/98									ζΣ:	\$																	
76	MCO MOI Execution SVT @KSC	10/1/98											•																	
77	Run SPAS for MPL Ephem files	10/1/98	10/1/98									♦																		
78	Final MPL SPK Files Delivered fromNAV	10/1/98	10/2/98									\(\)																		
7 9	Determine Ephemeris Strategy for launch	10/2/98	10/6/98				Ī					0	❖																	
8 0	Set MPL Red Alarm Limits for Cruise	10/2/98	10/6/98									4	❖																	
8 1	MPL Launch Go/NOGO Criteria	10/2/98	10/12/98									Q	+	\$																
8 2	MCO Aerobraking Execution SVT @KSC	10/5/98										•	>																	
8 3	MPL Launch ORT Tabletop	10/5/98	10/5/98									١,	\																	
8 4	MPL Parameter Review	10/5/98	10/6/98				Ī					Τ.	\(\)																	
8 5	Update MCO procedures	10/5/98	10/10/98				Ī				T	١.	\propto	>																
8 6	MCO Mapping Execution SVT @KSC	10/7/98					Ĺ						\rightarrow																	
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	Activity Name	Date	Date	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30) 7	1	4 2	1 2	8 4	1 1	11 1	8	25	1
108	Execute MPL MOS-Compat SVT	10/22/98	10/27/98												⊘	\$															
109	Release Final MPL MOG/BD	10/22/98	11/1/98												Ø	=															
110	MPL Cruise/TCM ORT Rehearsal	10/26/98	10/31/98												<	$\Rightarrow \diamond$															
111	STL Test MPL Launch Contingency CMD Files	10/27/98	10/31/98													⋘															
112	Update MPL CMD Dictionary	10/27/98	11/10/98													\Diamond		>													
113	Release Final MPL TLM Dict	10/28/98	11/4/98													✡	\$														
114	Update MPL procedures	11/2/98	11/8/98													<	\succeq	\													
115	Final MPL Launch Contingency Plans Approved	11/2/98	12/22/98													<	\succ						÷	➾							
116	MPL Cruise/TCM ORT Final	11/9/98	11/14/98														<	⋙													
117	Release Final MPL CMD Dict	11/10/98	11/16/98														•	◯	>												
118	Flight Certification Complete	12/9/98	1/2/99																			0	+	÷	+	\$					
119	MCO Launch	12/10/98																				4			T		T		7	\exists	
120	MPL Launch	1/3/99																							,	\					
				3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30) 7	7 1	4 2	1 2	8 4	1 1	11 1	8	25	1



Issues & Concerns

- System Verification Tests Continuing Effort
 - Tests Have Slipped to the Right
 - Need to Balance the Scope with the Resources Available
 - MSP and MSOP Have Opened Discussions to Balance Objectives
- Late Delivery of Dictionaries
 - Documentation Not Available Until Late in the Program
 - Adding 2 People to Ensure the Current Dates Will Be Kept
 - Kendall Nii (Delay Transition to MSP 2001)
 - Kacey Koonce (Transition from Stardust)
- STL Resource is Overbooked
 - FSW Acceptance Test is Behind Schedule
 - Upgrading "SoftSim" Capability for ATP
 - SVT and Other ATLO Procedure Check-out
 - ORTs Beginning in September



Readiness Statement

- We Will Be Ready for the MSP 98 Orbiter Launch
 - We Are Somewhat Behind Where We Would Like to Be At This Point
 - We Have a Plan and Schedule That Supports Being Ready
 - We Have the Resources and the Program Support to Accomplish What Needs to Be Done



MSOP NAVIGATION TEAM

PASQUALE ESPOSITO

AGENDA

- FUNCTIONS
- NAVIGATION OVERVIEW
- NEW NAVIGATION CAPABILITIES
- STAFFING AND ORGANIZATION
- TRAINING, PROCEDURES AND OIAs
- TESTING AND VALIDATION
- AB2: ABM STRATEGY AND ORT
- AB2: NAV WORK SCHEDULE SUMMARY
- MULTI-MISSION OPERATIONS
- RESILIENCY
- TEAM SCHEDULE
- OPEN ISSUES AND RESOLUTION
- READINESS



AB2 FUNCTIONS AND RESPONSIBILITIES

ORBIT DETERMINATION

- SHORT-TERM PREDICTION (HOURS TO DAYS)
 PROVIDE Tp, Rp, ... VIA THE OPTG AND EPHEMERIS (SPK) FILES
- LONG-TERM PREDICTION (DAYS TO MONTHS)
 MONITOR AND ASSESS EVOLUTION OF THE ORBIT ASSURE CORRECT TERMINATION OF AEROBRAKING
- RECONSTRUCTION
 MONITOR ORBIT CHANGES
 ASCERTAIN THAT ABMs ACHIEVED THE CORRECT ORBIT

UPDATE ATMOSPHERIC DENSITY OPERATIONAL MODEL

 PROVIDE DENSITY, VARIATION AND PREDICTIONS. KEATING AND JUSTUS WILL PROVIDE DENSITY INFORMATION DIRECTLY TO NAVIGATION

PROPULSIVE MANEUVER DESIGN

- MAJOR MANEUVERS (AB-1, ABX AND TMO) DESIGNED DURING AB
- CORRIDOR MANEUVERS HAVE ALREADY BEEN DESIGNED
- MAINTAIN SPACECRAFT WITHIN DYNAMIC PRESSURE CORRIDOR



AB2 FUNCTIONS AND RESPONSIBILITIES

AEROBRAKING OPERATIONS DECISION PROCESS

PARTICIPATE IN ABM DECISION; PROVIDE NAVIGATION
 INFORMATION. RESPOND TO UNEXPECTED AB CONDITIONS.
 MAINTAIN CAPABILITY TO ADJUST AB BASELINE PLAN

DELIVER NAV INFORMATION TO PROJECT TEAMS

OPTG, SPK, LIGHT-TIME, P-FILE, MANEUVER PROFILE FILE

ORBITAL PREDICTION REQUIREMENTS

- PREDICT TIME OF PERIAPSIS PASSAGE (Tp) TO 225-281 S; ASSUME A 70% ATMOSPHERIC DENSITY VARIATION. Tp ACCURACY IS DERIVED FROM THE SPACECRAFT'S ANGLE OF ATTACK REQUIREMENT.
- PREDICT PERIAPSIS DISTANCE / ALTITUDE (Rp) TO 1.5 KM.

TRACKING DATA ACQUISITION BASELINE

- NEARLY CONTINUOUS DSN STATION COVERAGE HAS BEEN SCHEDULED
- NO TRACKING DATA ACQUISITION WITHIN APPROXIMATELY 0.5
 HOURS OF PERIAPSIS IS POSSIBLE DUE TO SPACECRAFT AND ORBIT
 CONSTRAINTS. NO DATA ACQUISITION DURING OCCULTATIONS AND
 MOLA ISHs.



AB2 NAVIGATION OPERATIONS OVERVIEW

	WALKIN	MAI EARLY	N PI	LATE	WALKOUT
DATE	09/14/98	09/16/98		02/01/99	02/04/99
PERIOD (HRS)	11.6	11.5		2.2	2.0
ALTITUDE (hp, KM)	172.4	110.3		100.4	103.4
DENSITY (KG/KM3)	0.037	16.9		16.1	15.9
DYN PRESSURE(N/M2)	0.00	0.18		0.11	0.11
DELTA-P(S) PER ORBIT	-0.5	-198.		-24.	-24.
DURATION (DAYS)	4.15		142.		4.5
ABMs	3		17		3*

^{*} ABX(AB EXIT MANEUVER) OCCURS ON 2/9/99



NEW AB2 CAPABILITY

- ARDVARC (AUTOMATED RADIOMETRIC DATA VISUALIZATION AND REAL TIME CONDITIONING) PROGRAM AND REAL-TIME TRACKING DATA ACCESS
- LONGITUDE DEPENDENT ATMOSPHERIC DENSITY MODEL
- TRIAXIAL ELLIPSOID MARS REFERENCE SURFACE FOR ALTITUDE CALCULATIONS
- SHALL ADOPT A VARIABLE RUNNING MEAN (N=3,4,5, ...) FOR DYNAMIC PRESSURE TRENDING
- SHALL FTP NAV FILES DIRECTLY TO THE ACCELEROMETER TEAM'S SERVER FOR QUICK-LOOK AUTOMATED ANALYSIS
- EITHER EXPONENTIAL DENSITY AND MARS-GRAM MODELS FOR DENSITY RECONSTRUCTION USING RADIOMETRIC DATA ANALYSIS
- UPDATE MARS-GRAM USING CURRENT CLIMATE FACTORS AS PROVIDED BY JUSTUS



NAVIGATION MCO AND MPL FUNCTIONS

- NAVIGATE THE SPACECRAFT DURING THE INTER-PLANETARY PHASE
 - SPECIFY TRACKING DATA ACQUISITION INFORMATION
 - ASSESS TRACKING DATA ACCURACY
 - ANALYZE TRACKING DATA AND DETERMINE TRAJECTORY RECONSTRUCTION AND PREDICTION
 - UPDATE SPACECRAFT MODELS (SRP, AMD, SMALL FORCES, ...)
 - PROVIDE NAVIGATION PRODUCTS (SPK, LT, STATRJ, ...) TO THE FLIGHT TEAMS VIA THE FIS AND TO TMOD VIA THE INTERFACE OSCAR (S/C EPHEMERIS FOR DSN STATION ACQUISITION AND TRACKING)
 - SPECIFY PROPULSIVE MANEUVERS FOR TCMs
 - ADHERE TO PLANETARY PROTECTION AND SUN-SPACECRAFT CONSTRAINTS
 - PROVIDE PROPULSIVE MANEUVER VERIFICATION AND RECONSTRUCTION
 - REVIEW SELECTED SEQUENCES FOR NAVIGATION EVENTS



MCO/MPL NAV OPERATIONS OVERVIEW

EVENT		<u>MCO</u>	MPL	MGS AB2*
INITIAL A	ACQ	09/25/98-R	10/09/98-R	10.5
REHEA	ARSAL/ORT	10/07	10/21	9.3
		11/17		6.0
TCM-1	REHEARSAL	09/28 TO 10/2	10/26 TO 10/30	10.2
	ORT	10/12 TO 10/16	11/09 TO 11/13	8.8
LAUNCH		12/10/98-	01/03/99-	4.6
INTE	RVAL	12/25/98	01/27/99	4.0
TON 4/1	. 45\	40/05/00**	04/40/00	4.0
TCM-1(L	+15)	12/25/98**	01/18/99	4.0
TCM-2 (L	- +45)	01/24/99	02/17/99	2.5
	,			ABX: 2/9/99
ENCOUN	ITER	09/23/99	12/03/99	
* ORB	IT PERIOD HOURS	S **	FARLIFR(2 DAYS)	

^{*} ORBIT PERIOD, HOURS

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MSOP READINESS REVIEW: PART 1

8/26-27/98

^{**} EARLIER(2 DAYS)



NEW MARS'98 CAPABILITY

- MPL SMALL FORCES PROGRAM FOR RECONSTRUCTION AND PREDICTION
 - LAST PROGRAM (PACKET_DECOM_LNDR) TO BE DELIVERED 8/25/98
- SIGMA PROGRAM: NEW TRACKING DATA ANALYSIS AND ESTIMATION CAPABILITY
- REPLACED AGING HARDWARE WITH NEWER HP-735 AND HP-720 COMPUTERS IN THE NCF (PHOBOS, DEIMOS AND CYDONIA)



TRAINING

- FIVE OF THE SIX NAVIGATORS PARTICIPATED IN MGS AND MARS OBSERVER INTERPLANETARY AND MGS AB1 FLIGHT OPERATIONS
- COMPLETED AB2 ORT (PERIOD=1.9 HOURS) AND WALK-THROUGHS. ADDITIONAL TRAINING SCHEDULED FOR MARS'98 ORTs.
- PARTICIPATED IN MARS'98 MISSION SYSTEM TESTS. ALSO PARTICIPATED IN SUB-SYSTEM AND SYSTEM SOFTWARE AND GDS TESTING.
- NEW NAVIGATORS SHALL COMPLETE A TRAINING EXERCISE INVOLVING THE ANALYSIS OF DOPPLER AND SRA RANGE DATA COVERING THE MGS AND/OR MPF INTERPLANETARY PHASES.
- NAVIGATION TRAINING PLAN PUBLISHED ON 4/22/96
 - 20 PROCEDURES PUBLISHED NEW PROCEDURES IN PROGRESS
 - TWO MARS OBSERVER AAS / AIAA CONFERENCE PAPERS (PUBL 2/14/94)
 - THREE MGS AND ONE MARS'98 DEVELOPMENT CONFERENCE PAPERS (PUBL 1997-1998)
- CROSS-TRAINING IS AN ON-GOING ACTIVITY



OPERATIONAL PROCEDURES

<u>NUMBER</u>	<u>TITLE</u>	<u>STATUS</u>
NAV-0001	GVPSTATE / ICPREP EXECUTION - TARGET INTERFACE POINT (TIP) INITIAL CONDITIONS	FINAL
NAV-0002	INTER-CENTER VECTOR (ICV) FILE TRANSFER FROM THE DSN INTERFACE (OSCAR) TO THE NAVIGATION TEAM	FINAL
NAV-0003	ORBIT TRACKING DATA FILE (ODF) TRANSFER FROM THE DSN INTERFACE (OSCAR) TO THE NAVIGATION TEAM. UPDATE FOR ARDVARC SOFTWARE AND REAL-TIME DATA FLOW TO THE NAVIGATION TEAM	FINAL *
NAV-0004	TRANSFER OF MEDIA CALIBRATION, TIME AND POLAR MOTION AND EARTH ORIENTATION PARAMETER FILES FROM THE DSN INTERFACE (OSCAR) TO THE NAV COMPUTER	FINAL
NAV-0005	ANGULAR MOMENTUM DESATURATION (AMD) FILE TRANSFER AND INPUT TO DPTRAJ	FINAL
NAV-0006	NAVIGATION PROCESS: ORBIT DETERMINATION AND PROPULSIVE MANEUVER ASSESSMENT	FINAL
NAV-0007	NAVIGATION PROCESS: DESIGN AND VERIFICATION OF PROPULSIVE MANEUVERS	FINAL
NAV-0008	SPACECRAFT EPHEMERIS (P-FILE) GENERATION AND TRANSFER TO THE DSN/NAV INTERFACE (OSCAR)	FINAL
	* UPDATE REQUIRED	

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MSOP READINESS REVIEW: PART 1

8/26-27/98



OPERATIONAL PROCEDURES

NUMBER	TITLE	<u>STATUS</u>
NAV-0009	SPK FILE GENERATION AND TRANSFER TO THE PDB	FINAL
NAV-0010	LIGHT TIME FILE GENERATION AND TRANSFER TO THE PDB	FINAL
NAV-0011	STATION POLYNOMIAL (STATRJ) FILE GENERATION AND TRANSFER TO THE PDB	FINAL
NAV-0012	ORBIT PROPAGATION, TIMING AND GEOMETRY FILE (OPTG) GENERATION AND TRANSFER TO THE PDB	FINAL
NAV-0013	REAL TIME RADIOMETRIC DATA DISPLAY. UPDATE USING ARDVARC DISPLAY	FINAL *
NAV-0014	GENERATE AND ANALYZE DIFFERENCED DOPPLER DATA	FINAL
NAV-0015	DETERMINE ATMOSPHERIC DENSITY MODEL PARAMETERS ESTABLISH DATABASE FOR PREDICTION AND SHORT-TERM VARIATION	FINAL
NAV-0016	DETERMINE MARS GRAVITY FIELD MODEL COEFFICIENTS	FINAL
NAV-0017	GUIDELINES FOR PROPULSIVE MANEUVER MODEL/FILE SELECTION (OFF-THE-SHELF) THROUGHOUT AEROBRAKING	FINAL
NAV-0018	MAINTAIN AND UPDATE NAVIGATION AEROBRAKING DATABASE MONITOR AND PREDICT AEROBRAKING PROGRESS	FINAL
NAV-0019	SFDU WRAP/UNWRAP AND PDB ACCESS FOR FILE TRANSFER. UPDATE FOR FIS.	FINAL *
	* UPDATE REQUIRED	



NEW OPERATIONAL PROCEDURES

<u>NUMBER</u>	<u>TITLE</u>	<u>STATUS</u>
NAV-0020	MAPPING ORBIT ELEMENTS	FINAL
NAV-0021	MPL SMALL FORCES RECONSTRUCTION AND PREDICTION	IN PROGRESS
NAV-0022	IMPLEMENT DRAG-PASS EFFECTIVE DELTA-VELOCITY FROM ACCELEROMETER DATA	IN PROGRESS

NOTES

- 1. SMALL FORCES RECONSTRUCTION SOFTWARE USING STL DATA GENERATED BY LMA HAS BEEN TESTED.
- 2. MCO AND MPL TCM-1 FILES AND MCO PITCH-OVER MOI MANEUVER FILES (MPDF AND MPF) HAVE BEEN GENERATED FOR MSTs.



OPERATIONAL INTERFACE AGREEMENTS

MGS NAVIGATION GENERATED OIAs

NUMBER	TITLE
NAV-001	LIGHT TIME FILE
NAV-002	STATION POLYNOMIAL FILE (STATRJ)
NAV-003	SPACECRAFT EPHEMERIS FILE (P-FILE)
NAV-004	NAVIGATION TRIGGER FILE
NAV-005	ORBIT PROPAGATION, TIMING AND GEOMETRY FILE
NAV-006	SP KERNEL (SPK) FILE
NAV-007	PLANETARY CONSTANTS KERNEL (PCK) FILE
NAV-008	MANEUVER PROFILE FILE
NAV-009	ORBIT NUMBER FILE

ALL OF THESE OIAS ARE IN FINAL FORM AND HAVE BEEN SIGNED

MCO/MPL NAVIGATION GENERATED OIAs

NUMBER	<u>TITLE</u>
NAV-001	LIGHT TIME FILE
NAV-002	STATION POLYNOMIAL FILE (STATRJ)
NAV-003	SPACECRAFT EPHEMERIS FILE (P-FILE)
NAV-004	NAVIGATION TRIGGER FILE
NAV-005	ORBIT PROPAGATION, TIMING AND GEOMETRY FILE
NAV-006	SP KERNEL (SPK) FILE
NAV-007	PLANETARY CONSTANTS KERNEL (PCK) FILE
NAV-008	MANEUVER PROFILE FILE
NAV-009	ORBIT NUMBER FILE
NAV-010	LANDER OPTG
NAV-011	LANDER ENTRY STATE AND UNCERTAINTY

ALL OF THESE OIAs ARE BEING PREPARED FOR SIGNATURE



TESTING AND VALIDATION

- SUBSYSTEM TESTING OF NAV SOFTWARE COMPLETED BY 6/28/98; APPROX 90 REGRESSION TESTS ANALYZED
- SYSTEM TESTING OF NAV AND TMOD SOFTWARE CARRIED OUT DURING APRIL THROUGH JULY 1998.
 - GENERATED NAV MPL FILES FOR THE INTERPLANETARY PHASE AND AB AND MAPPING FILES FOR THE MCO. THESE WERE TRANSFERRED TO THE FIS FOR ACCESS BY THE FLIGHT OPERATIONS TEAMS.
 - AB1 AND SPO TRACKING DATA WERE ANALYZED AND FILES GENERATED USING BOTH PREVIOUS AND NEW NAV SOFTWARE. VALIDATION WAS SUCCESSFUL.
- ARDVARC SOFTWARE HAS BEEN VALIDATED
 INTERMITTENTLY SINCE APRIL'98. THE REAL-TIME MGS
 TRACKING DATA LINE HAS BEEN OPERATIONAL
 WITHOUT PROBLEMS.



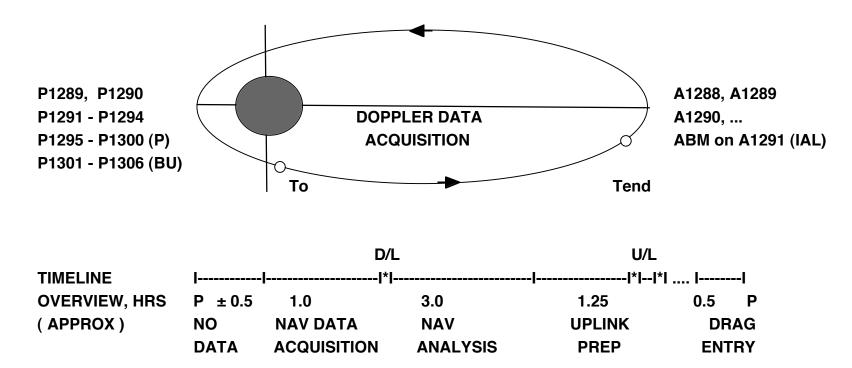
AB2 ABM STRATEGY AND READINESS

AEROBRAKING MANEUVER DESIGN

- MAJOR MANEUVERS (AB-1, ABX, TMO)
 - ANALYSIS AND DESIGN DURING AEROBRAKING
 - COMPLETED PRELIMINARY AB-1 DESIGN ON 8/19/98 FILES TRANSFERRED TO THE SCT
- CORRIDOR CONTROL MANEUVERS (AB-2,3, ABMs)
 - ANALYSIS AND DESIGN COMPLETED
 - 40 AB BASELINE AND 10 AB CONTINGENCY MPFs HAVE BEEN DELIVERED TO SPACECRAFT TEAM ON 7/6/98
 - RELATED NAV DESIGN PRODUCTS THROUGHOUT AB2 DELIVERED (SPK, OPTG, STATRJ, LTF, P-FILE) TO THE SCT ON 6/19/98
 - 50 CVFs (ABM ATTITUDE QUATERNIONS) HAVE BEEN RECEIVED FROM THE SCT AND CHECKED FOR CORRECTNESS (7/20/98)



AB2 NAV ANALYSIS STRATEGY FOR P=1.9 HR ORT (080498)



PURPOSE: PROVIDE PREDICTED Tp AND Rp FOR SPACECRAFT ENTRY INTO THE DRAG PASS OR PERIAPSIS. To REFERS TO THE START OF THE TRACKING DATA ACQUISITION; PERIAPSIS P1289 AND P1290 OCCUR DURING THIS DATA ACQUISITION (PERIOD = 1.9 HRS). THE FIRST PREDICTED Tp OCCURS FOR P1291. FOR PLANNING,

P1288 = 02/06/99, 09:28:26 ET AND To = P1288 + 0.5 HOURS

P1290 = 02/06/99, 13:22:18 ET AND Tend = P1290 + 1.5 HOURS

UPLINK(U/L) INCLUDES THE U/L WINDOW, INFORMATION TRANSMISSION AND THE OWLT.



Mars Surveyor AB2 NAV ANALYSIS ORT TIMELINE (P= 1.9 HRS) Operations

	TIME	TIME
<u>EVENT</u>	DURATION (H:M:S)	ACCUM'D (H:M)
EPOCH, To (P1288 + 30 MIN, ET)		0:0
P1289, P1290		01:24, 03:18
END DOPPLER DATA ACQUISITION		04:48
DOWNLINK (OWLT) PLUS 1 MINUTE	00:10:18	04:58.3
ODF (ARDVARC)	00:05:00	05:03.3
NAV ANALYSIS	03:00:00	08:03.3
P1291 - FIRST Tp PREDICTION		05:12
P1292 - SECOND Tp PREDICTION		07:06
NAV FILES ON THE FIS	00:10:00	08:13.3
FILE PREPARATION FOR UPLINK	01:15:00	09:28.3
P1293 - THIRD Tp PREDICTION		09:00
TIME-DELAY FOR WINDOW OPENING		
FIRST U/L WINDOW DURATION	~01:00:00	
UPLINK TO SPACECRAFT (OWLT)	00:09:18	
DOWNLINK CMD VERIFICATION (OWLT)	00:09:18	
P1294 - FOURTH Tp PREDICTION		10:54
TIME-DELAY FOR WINDOW OPENING		
SECOND U/L WINDOW DURATION	~00:50:00	
UPLINK TO SPACECRAFT (OWLT)	00:09:18	
DOWNLINK CMD VERIFICATION (OWLT)	00:09:18	
P1295 - FIFTH Tp PREDICTION-PRIME		12:48



NAVIGATION WORK SCHEDULE: WALKOUT

OPERATIONAL READINESS TEST

- TEN TP PREDICTIONS WITHIN THE REQUIREMENT; SIX OF THESE ARE PRIME.
- NAV ANALYSIS REQUIRED EVERY 11.4 HOURS (6x1.9 HRS)
 FOR FILE DELIVERY

WORSE CASE PLAN (WALK-THROUGH)

- ONLY SEVEN TP PREDICTIONS CAN BE PROVIDED WITHIN THE REQUIREMENT; THREE OF THESE ARE PRIME
- NAV ANALYSIS REQUIRED EVERY 5.7 HOURS (3x1.9 HRS)
 FOR FILE DELIVERY



IDEAL DAILY WORK SCHEDULE (P = 1.9 HOURS):ORT

	TIMES (REL	ATIVE)	Tp PREDICTIONS WITHIN
PERIAPSIS	<u>HRS</u>	HHMM/FILE	REQUIREMENT: TOTAL / PRIME
P-1	-3.4	0436	
P0	-1.5	0630	
	0.0	0800/ D1	
P1	0.4	0824	
P2	2.3	1018	
	3.0	1100/ OPTG 1	10 /6 (Tp5,10)
P3	4.2	1212	
P4	6.1	1406	
P5	8.0	1600	
P6	9.9	1754	
	11.4	1924/ D2	
P7	11.8	1948	
P8	13.7	2142	
	14.4	2224/ OPTG 2	10 /6 (Tp11,16)
P9	15.6	2336	
P10	17.5	0130	
P11	19.4	0324	

CONCLUSION: SIX PRIME TP PREDICTIONS PER NAV ANALYSIS AND 4 NON-USEABLE PREDICTIONS; ANALYSIS EVERY 11.4 HOURS THEREFORE 2.1 NAV SHIFTS PER DAY FOR FILE DELIVERY (DRAG SEQUENCE)



IDEAL DAILY WORK SCHEDULE (P = 1.9 HOURS):W-T

	TIMES (RELATIVE)		Tp PREDICTIONS WITHIN		
PERIAPSIS	<u>HRS</u>	HHMM/FILE	REQUIREMENT: TOTAL / PRIME		
P-1	-3.4	0436			
P0	-1.5	0630			
	0.0	0800/ D1			
P1	0.4	0824			
P2	2.3	1018			
	3.0	1100/ OPTG 1	7/3 (Tp5,6,7)		
P3	4.2	1212			
	5.7	1342/ D2			
P4	6.1	1406			
P5	8.0	1600			
	8.7	1642/ OPTG 2	7/3 (Tp8,9,10)		
P6	9.9	1754			
	11.4	1924/ D3			
P7	11.8	1948			
P8	13.7	2142			
	14.4	2224/ OPTG 3	7 /3 (Tp11,12,13)		
P9	15.6	2336			
	17.1	0106/ D4			
P10	17.5	0130			
P11	19.4	0324			
	20.1	0406/ OPTG 4	7 /3 (Tp14,15,16)		

CONCLUSION: THREE PRIME Tp PREDICTIONS PER NAV ANALYSIS AND FOUR NON-USEABLE PREDICTIONS; ANALYSIS EVERY 5.7 HOURS THEREFORE 4.2 NAV SHIFTS PER DAY FOR FILE DELIVERY (DRAG SEQUENCE).

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AB2 NAVIGATION SUMMARY

DATE (ORBIT) <u>DAYS(ORBITS)</u> 09/16/98 (558) 24 (57)	PERIOD (<u>HRS)</u> 11.5	DP, SEC* (VARIES) -198. TO -168.	PREDICT Tp <u>TOTAL / PRIME</u> 2 / 2	COMMENTS (DAILY S START MAIN PHASE	<u>SHIFTS)</u> (2-1)**
10/10/98 (615) 38 (125)	9.0	-100. TO -135.	3/2		(1.3)
11/17/98 (740) 59 (336)	6.0	-60. TO -72.	4/3 5/3	OCCULTATIONS DEPENDS ON UL PREF	(1.3) PARATION
01/15/99 (1076) 20 (192)	3.0	-19. TO -25.	6/3 5/3	DEPENDS ON UL PRE	(2.7) PARATION
02/04/99 (1268) 5 (56)	2.0	-24. TO -12.	10/6 07/3	START WALK OUT ORT AND WALK-THRO	(2.0/4.0) DUGH
<u>02/09/99 (1324)</u> 146 (766)	1.9			END WALK OUT - ABX	

^{*} DUE TO PREDICTED GEOMETRY VARIATION; DOES NOT ACCOUNT FOR INTRINSIC DENSITY VARIATION (70%).

^{**} NAV SHALL ANALYZE EVERY ORBIT FOR FIVE DAYS TO MONITOR THE DENSITY AND ITS VARIATION.



MULTI-MISSION OPERATIONS

- ALL SIX NAVIGATORS SHALL PARTICIPATE IN AB2 FLIGHT OPERATIONS. A SEVENTH NAVIGATOR SHALL BE AVAILABLE FOR TWO QUARTERS DURING AB2 AND THE LAUNCH THROUGH TCM-1 PHASE OF BOTH MARS'98 SPACECRAFT
- A LEAD NAVIGATOR SHALL BE ASIGNED TO EACH OF THE MARS'98 SPACECRAFT. THERE IS SUFFICIENT CROSS-TRAINING WITHIN THE TEAM FOR OTHER NAVIGATORS TO PARTICIPATE IN THIS ANALYSIS.
- THE MOST INTENSIVE PERIOD SHALL OCCUR DURING THE FIRST FIVE DAYS OF EACH OF THE MARS'98 LAUNCHES WHEN MGS IS STILL IN AB2 WITH AN ORBIT PERIOD OF 4.6-2.5 HOURS



RESILIENCY

- NAVIGATORS ARE CROSS-TRAINED AND CAN PARTICIPATE IN BOTH AB2 AND INTERPLANETARY PHASE FLIGHT OPERATIONS
- FIVE OF THE SIX NAVIGATORS HAVE EXTENSIVE FLIGHT OPERATIONS EXPERIENCE AND THE SIXTH NAVIGATOR BRINGS MARS'98 DEVELOPMENT EXPERIENCE
- A SEVENTH NAVIGATOR SHALL PARTICIPATE IN FLIGHT OPERATIONS FOR 2 QUARTERS. SECTION 312
 MANAGEMENT HAS BEEN NOTIFIED AND A PERSON HAS BEEN IDENTIFIED
- A BACK-UP PLAN EXISTS TO ENLIST A TRAINED AND QUALIFIED NAVIGATOR, PREVIOUSLY ON THE NAVIGATION TEAM, IN AN EMERGENCY SITUATION
- NAV TEAM CHIEF BACKUP SHALL BE IDENTIFIED
- RMDCT PROVIDES A BACKUP ODF DELIVERY CAPABILITY TO ARDVARC



NAVIGATION TEAM SCHEDULE

- THE PLAN IS THAT NO NAVIGATOR SHALL BE REQUIRED TO WORK MORE THAN 40 HOURS PER WEEK. HOWEVER, EACH NAVIGATOR'S WORK WEEK SHALL VARY IN BOTH HOURS AND DAYS
- THE POSSIBLE SINGLE EXCEPTION MAY INVOLVE HOLIDAY WORK (THANKSGIVING, CHRISTMAS AND NEW YEARS DAY). IF NECESSARY, EXTENDED WORK WEEK HOURS SHALL BE AUTHORIZED



NAVIGATION TEAM SCHEDULE

A ativity Name	Start	Finish	1998			1999			
Activity Name	Date	Date	Sept	Oct	Nov	Dec	Jan	Feb	Mar
MGS AB2-ABX	9/14/98	2/9/99	\Diamond					\Diamond	
M98 Init. Acq. Rs & ORTs									
MCO Rehearsal	9/25/98		\Diamond						
MCO ORT	10/7/98			\Diamond					
MPL Rehearsal	10/9/98			\Diamond					
MPL ORT	10/21/98			\Diamond					
MCO ORT	11/17/98				\Diamond				
M98 TCM1: Rs & ORTs									
MCO Rehearsal	9/28/98	10/2/98	♦	>					
MCO ORT	10/12/98	10/16/98		< <p>♦></p>					
MPL Rehearsal	10/26/98	10/30/98		< <	>				
MPL ORT	11/9/98	11/13/98			< <p></p>				
MCO Launch & TCMs									
Launch	12/10/98	12/25/98				$\Diamond \Diamond \Diamond$			
TCM1 (L+15)	12/23/98	1/9/99				\Diamond	\Diamond		
TCM2 (L+45)	1/24/99	2/8/99					\Diamond	\Rightarrow	
MPL Launch & TCMs									
Launch	1/3/99	1/27/99				<	\Diamond		
TCM1 (L+15)	1/18/99	2/11/99					\Diamond	\Rightarrow	
TCM2 (L+45)	2/17/99	3/13/99						\Diamond	\Rightarrow
MSOP Map Review	2/2/99						<	>	
MGS TMO	2/23/99							\Diamond	
MGS Mapping Phase	3/15/99								\Diamond
			Sept	Oct	Nov	Dec	Jan	Feb	Mar



OPEN ISSUES AND RESOLUTION

FOR MGS AB2:

- OIA FROM TMOD FOR THE REAL-TIME TRACKING DATA TRANSFER TO NAVIGATION AND RECOVERY PROCEDURE FOR ITS DISRUPTION. EXPECTED COMPLETION DATE: 8/26/98
- SCHEDULE FOR THE REAL-TIME DELIVERY OF THE ACCELEROMETER TEAM'S ATMOSPHERIC RESULTS.
 EXPECTED COMPLETION DATE: 8/25/98

FOR THE MCO AND MPL INTERPLANETARY PHASE:

- TESTING OF THE SMALL FORCES RECONSTRUCTION AND PREDICTION FILES NEEDS COMPLETION. EXPECTED COMPLETION DATE: 9/11/98
- FINALIZE SIS FOR SMALL FORCES FILE (PRELIMINARY SIS DISTRIBUTED). EXPECTED COMPLETION DATE: ACTON REVIEWING COMMENTS
- LMA NEEDS TO PROVIDE SRP INFORMATION FOR THE MCO AND MPL SPACECRAFT. EXPECTED COMPLETION DATE: ONGOING DISCUSSION WITH LMA



NAVIGATION READINESS

READINESS

BASED ON EACH NAVIGATOR'S EXPERIENCE, PREVIOUS
MARS GLOBAL SURVEYOR FLIGHT OPERATIONS, GDS
SYSTEM TESTING AND MARS'98 MST PARTICIPATION AND
PREPARATION DUE TO PROJECT SPONSORED
REHEARSALS AND OPERATIONAL READINESS TESTS, THE
MSOP NAVIGATION TEAM SHALL BE READY TO CONDUCT
MGS AB2, AND MCO AND MPL INTERPLANETARY FLIGHT
OPERATIONS

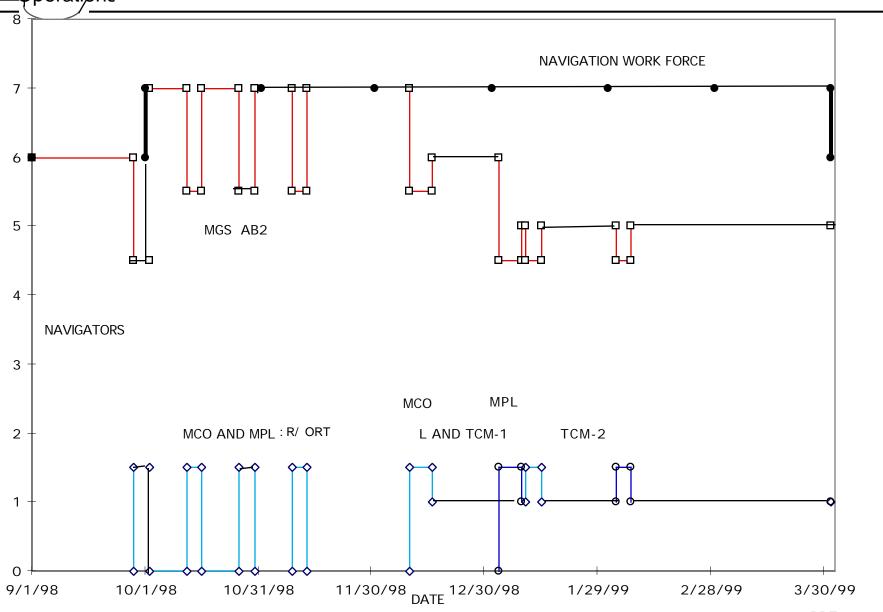


MSOP NAVIGATION TEAM BACKUP INFORMATION

PASQUALE ESPOSITO

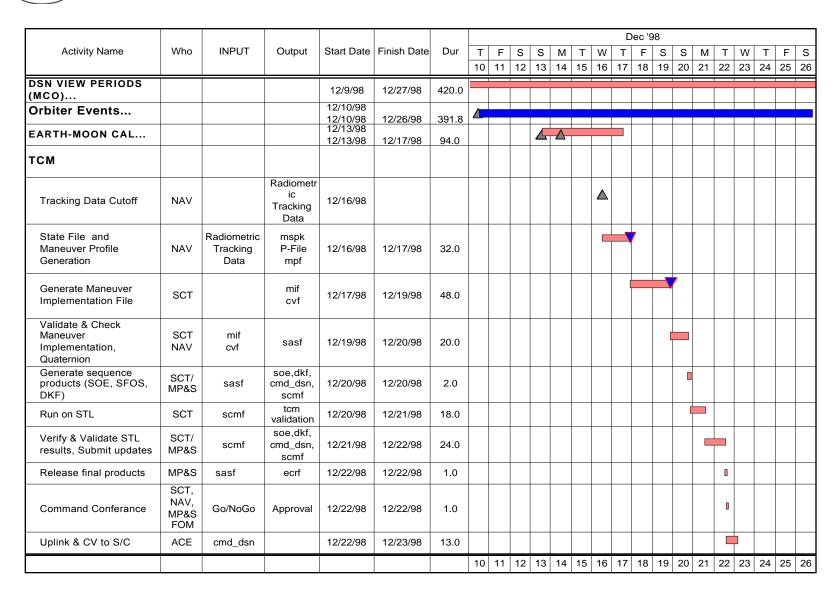
Mars Surveyor Operations

NAVIGATION WORKFORCE





MCO TCM-1 NAVIGATION TIMELINE





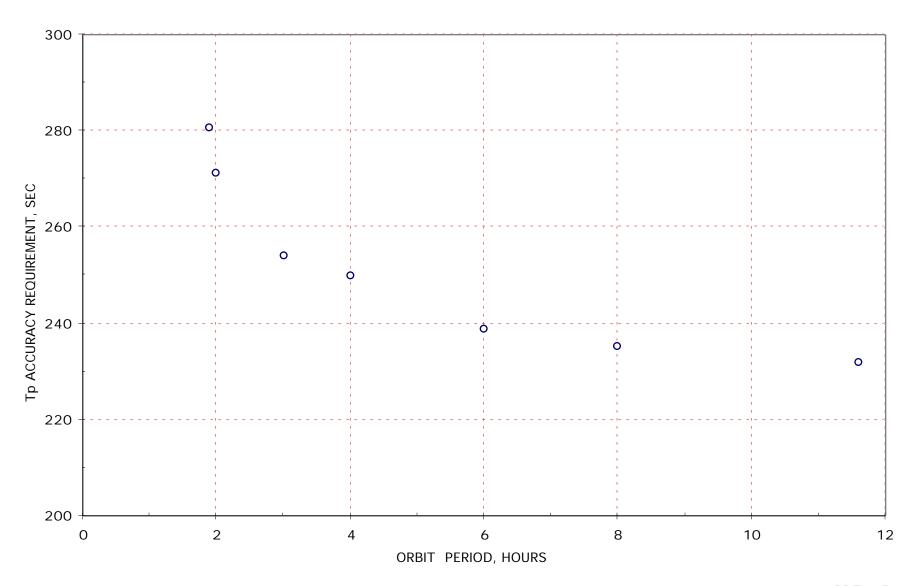
Mars Surveyor MGS TCM-1 NAVIGATION TIMELINE:EXAMPLE Operations

TCM-1 OPERATIONS TIMELINE

		Nov '96																						
	Activity Name	s	s	М	Т	W	Т	F	s	s	М	Т	W	Т	F	s	s	М	Т	W	Т	F	s	s
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Acquire Tracking Data					∇	\triangle	abla	∇	\triangle	abla	\triangle	abla	∇	\triangle	abla	∇	\triangle	abla	\triangle	\triangle	∇	\triangle	
2	NAV Provides ^ V Estimate to SCT SCT Provides MPDF to NAV				Injed	ction		VAN V 000			/ NA	v —												
3	Maneuver Profile File Generation								` ,			•												
4	Provide Ideal Maneuver Parameters to SCT											NAV 												
5	Generate Maneuver Implementaion File, C1e SASF											SCT	SC	۱										
6	Provide Implementaion File to NAV,SASF to MPS												1	SCT										
7	Validate and Check Maneuver Implementation File and Quaternion in SASF													NAV (3	1									
8	Generate C1e Sequence Products Including SOE,SFOS, & DKF													- 1	400	ı								
9	Run on STL														_	001	•	SCT						
10	Verify and Validate STL results																	301	†					
11	A. Flight Team Review B. MPS to correct errors															A		A	B MPS					
12	MPS releases Sequence Products (If Corrections)					erforn ofile						,			,	(M-	12d)		🗸 1200					
13	SCT Uplinks, Verifies by CV, & Retransmits if Necessary	(4)	C1e	con	nmar	plem nd co ssess	nfere	ence	, 1:00	0pm	PST	, Tue	e (M-	2d)	`		,		(4)	— 1	CM-	1 —		
14	C1e Sequence Active	(-,								,,					(
15	Maneuver Reconstruction / Assessment																			- 12		(5)	SCT	
16	Days From Maneuver			-17	-16	-15	-14	-13 -	12 -	11 -	10	-9	-8 -	-7	-6	-5	-4	-3	-2	-1	0	1	2	
	Days After Injection			-2	-1	0	1	2	3	4	. 5	6	7	8	9	10	0 ′	11 1	2 13	14	15	16	17	
17	Legend All Times are Pacific Time				=8	hrs			=6ł				l =4hrs			2hrs								
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24



PREDICTED PERIAPSIS TIME REQUIREMENT





Mission Planning and Sequencing Team

R. Brooks

RNB-1



MP&S Team Agenda

- Processes used for Aerobraking Phase-2 Support
- Processes used for M-98 Support
- New or modified procedures and processes
- Staffing
- Effects of Multi-mission Operations
- Resiliency
- Testing
- · Schedule
- Open items and resolution schedule
- · Readiness statement

Surveyor Processes used for Aerobraking Phase-2 Support

- Processes used to support Aerobraking Phase-2 are same as those used to support Phase-1 and Science Phasing Orbit.
 - Automated Sequence Processor (ASP) available 24/7.
 - Mission Planner/Sequence Integration Engineer (MPSIE) monitors ASP and responds to problems encountered during processing.
 - MPSIE availability for Aerobraking support:
 - Day shift, 7d/week, Sep. Feb.
 - Swing Shift, 5d/week, Oct.; 7d/week, Nov. Feb.
 - ON-CALL Mid Shift, 7d/week, Sep. Feb.
 - DSN Resource Scheduler (DSNRS) provides DSN resource allocation deliveries as needed by operations. Expected frequency once or twice per week during Aerobraking.



Processes used for M-98 Support

- Processes used to support Mars-98 flight operations are same as those used to support MGS flight operations.
 - Existing MSOP processes required ADAPTATION to accommodate Mars-98 operations. These processes were:
 - Real-time Commanding Processes
 - Stored Sequence Process
 - Real-time Commanding
 - EC Express Commanding
 - · IC Interactive Commanding
 - IFL Interactive File Loading
 - NIFL Non-Interactive File Loading
 - Stored Sequence Process
 - Shortened duration from MGS process
 - Event driven sequencing strategy now implemented.



New or Modified Procedures & Processes

- No truly NEW processes have been required from the MP& S.
- Used adapted ASP processes to permit File Load processing and adapted ACT to permit file tracking.
 - Adapted NIPC process now permits NIFL processing and tracking.
 - Adapted IC process now permits IFL processing and tracking.
- IFL and NIFL modifications were of an adaptive nature only to the ASP and the ACT.



Staffing

- Team staffing beginning in September is:
 - Team Chief 1
 - Mission Planner/Sequence Integration Engineers 6
 - DSN Resource Scheduler 1.5
- All MGS & M-98 tasks have been laid out on a per-shift basis and people assigned to each task.
 - MGS Aerobraking Support
 - MCO & MPL Test and Training Support
 - MCO & MPL Launch and Early Cruise flight operations support.
- All known tasks fit with the staffing levels provided above.
- Small amount of contingency available
 - Team Chief do SIE work.
 - SIEs provide M-98 support during their MGS support periods.

RNB-6

8/26-27/98



Effects of Multi-Mission Operations

- SIEs must be sure not to confuse tasks performed for one spacecraft with those for one of the others. Handled by software and procedures.
- Heaviest workload periods are December and January, immediately following MCO and MPL launches.

RNB-7



<u>Resiliency</u>

- Only small amount of contingency in staffing profile during December and January, but is acceptable with Team Chief as back-up SIE.
- There are no resources remaining to accomodate elective additions to the existing plan.
- STARDUST Sequence Team (at LMA) could be made available for MGS, MCO or MPL anomaly response.



Testing

- All team members are actively participating in the MGS aerobraking Test and Training exercises during August and Early September.
- All team members are actively participating in the M-98 Rehearsals and ORTs beginning in September.

Surveyor Peration Operational Interface Agreements and Procedures

- Only one OIA needs to be made OFFICIAL for MCO and MPL for the File Loading capability.
 - Input to ASP will be a binary formatted file.
 - Includes Spacecraft Team.
 - Includes Science Teams.
 - Due for completion/sign-off in September.
- All MP&S Team procedures are complete, up-to-date, and available on the MP&S Team homepage at http:// mgsw3.jpl.nasa.gov/seq/seq.html



Schedule (Test and Training)

• Schedule derived from MSOP integrated schedule of MGS, MCO and MPL activities.

I I CIA Table Ton	10/05/00	
L-L&IA Table Top	10/05/98	
L-L&IA Rehearsal	10/09/98	
L-Cruise/TCM Table Top	10/19/98	
L-L&IA ORT	10/21/98	
L-Cruise/TCM Rehearsal	10/26/98	10/30/98
L-Cruise/TCM ORT	11/09/98	11/13/98
O-L&IA Table Top	09/21/98	
O-Cruise/TCM Table Top	09/23/98	
O-L&IA Rehearsal	09/25/98	
O-Cruise/TCM Rehearsal	09/28/98	10/09/98
O-L&IA ORT	10/05/98	
O-Cruise/TCM ORT	10/12/98	10/16/98
O-EM Cal/UHF Test Table Top	11/02/98	
O-EM CAL/UHF Test Rehearsal	11/05/98	11/06/98
O-L&IA ORT	11/17/98	
O-EM Cal/UHF Test ORT	11/19/98	11/21/98

MSOP Readiness Review: Part I



Schedule (Flight Operations)

• Schedule derived from MSOP integrated schedule of MGS, MCO and MPL activities.

Begin MGS Aerobraking Phase-2	09/14/98	
MGS Aerobraking Support	09/14/98	02/28/99
MGS MPST A/B Day Shift Support	09/14/98	02/28/99
MGS MPST A/B Swing Shift Support	10/05/98	02/28/99
MGS MPST A/B ON-CALL Mid Shift Support	09/14/98	02/28/99
MCO - LAUNCH	12/10/98	
MCO - Launch SOE/DKF Generation	10/05/98	10/31/98
MCO - SCI1 Sequence Generation	11/23/98	12/11/98
MCO - SCI2 Sequence Generation	01/28/99	02/17/99
MCO - TCM1 Execution	12/25/98	
MCO - TCM1 Sequence Generation	11/17/98	12/04/98
MCO - TCM1 Sequence Update	12/18/98	12/24/98
MCO - TCM2 Execution	01/23/99	
MCO - TCM2 Sequence Generation	12/18/98	01/03/99
MCO - TCM2 Sequence Update	01/04/99	01/08/99
MCO - 1st Daily Contact Seq Dev	11/17/98	12/09/98
MPL - LAUNCH	01/03/99	
MPL - Launch SOE/DKF Generation	10/05/98	10/31/98
MPL - M&T1 Sequence Generation	01/12/99	02/01/99
MPL - SCI1 Sequence Generation	01/12/99	02/01/99
MPL - TCM1 Sequence Generation	12/21/98	01/11/99
MPL - TCM1 Sequence Update	01/14/99	01/17/99
MPL - TCM1 Execution	01/18/99	
MPL - TCM2 Execution	02/17/99	
MPL - TCM2 Sequence Generation	01/12/99	01/26/99
MPL - TCM2 Sequence Update	01/27/99	02/01/99
MPL - 1st Daily Contact Seq Dev	11/17/98	12/09/98

MSOP Readiness Review: Part I



Open Items / Resolution Schedule

- Need to fill remaining SIE and DSNRS positions on team prior to their need during Aerobraking support. Working very closely with JPL sections to accomplish this prior to September 14. Expect success.
- STARDUST has expressed a desire to have the Automated Sequence Processor delivered as part of their MSOP provided capability set. MP&S Team impacts and implementation strategy are in negotiations with STARDUST and expect agreement for support by early September.
- File Loading and Tracking capability will be delivered on 09/ 01/98 as planned for use during Sept/early Oct ORTs. Final validation shall be completed prior to MCO Launch.



Readiness Statement

- MP&S Team is ready to support MGS aerobraking with existing staffing levels and procedures.
- MP&S will be ready to support M-98 Launch and Early Cruise after completion of Test and Training and hiring of new MPSIE and DSNRS.



SCIENCE OFFICE

TOM THORPE



TOPICS

- SCIENCE OFFICE ACTIVITY CHANGES
- MGS FLIGHT SCIENCE EVENTS
- MGS SCIENCE FACILITY STATUS
 - ON-ORBIT EXPERIENCE TO DATE
 - SCIENCE ACTIVITIES FOR NEXT PERIOD
 - SCHEDULE
- MGS SCIENCE OPERATIONS READINESS
- M'98 FLIGHT EVENTS
- M'98 SCIENCE FACILITY STATUS
 - MORR AGENDA
 - SCHEDULE
- M'98 SCIENCE OPERATIONS READINESS



SCIENCE OFFICE ACTIVITY CHANGES

MGS ACTIVITIES DURING THE NEXT PHASE

LIMITED DATA ACQUISITION
ARCHIVING PRE-MAPPING DATA SETS
IMPLEMENTATION AND TESTING FOR MAPPING PHASE
MORR FOR MAPPING

M'98 ACTIVITIES DURING THE NEXT PHASE

EOP NEGOTIATION
MORR FOR CRUISE
CONTRACT/LOA MODIFICATION FOR OPERATIONS
PARTICIPATION IN END-TO-END FACILITY TESTING
ORT FOR EARLY CRUISE CALIBRATION
EARLY CRUISE CALIBRATION AND DATA REDUCTION



MGS FLIGHT SCIENCE EVENTS

DURING UPCOMING PERIOD (SEPTEMBER 14, 1998 TO MARCH 1, 1999) SCIENCE FLIGHT EVENTS ARE SCHEDULED AS FOLLOWS:

TWO INSTRUMENTS WILL ACQUIRE DATA NEAR PERIAPSIS AT START OF A/B-2

MAG AND TES (ACCELEROMETER DATA WILL ALSO BE ARCHIVED)
TES WILL PROVIDE LIMITED SUPPORT TO A/B: TRENDS AVAILABLE
WITHIN FEW DAYS

5-10 MINUTE PB/ORBIT AT 42 KB=10:1 RECORDED RATE
POWER/SEQUENCE CONSTRAINTS WILL END DATA TAKING BY END
OF DECEMBER 1998

RS WILL RECORD OCCULTATIONS IN ONE WAY TELEMETRY MODE BEGINNING WITH OCCULTATIONS ONSET NOVEMBER 22, 1998



MGS SCIENCE OPERATIONS ON-ORBIT EXPERIENCE

A/B-1, SPO-1 AND SPO-2 EXPERIENCE

DEMONSTRATED SITE OPERATIONAL CAPABILITIES
IMPROVED U/L AND D/L INTERFACE ACTIVITY
IMPROVED NIPC PROCESS, TOOLS
DATA RETURN IMPROVEMENTS, MONITORING
DATA ACQUIRED AT A VARIETY OF S/C ORIENTATIONS
TRANSITION TO MAPPING O/S COMPLETED (SOPC UPGRADE, SOLARIS, FIS)
TESTED DATA PROCESSING CAPABILITIES AT NON-MAPPING GEOMETRIES,
LIGHTING ANGLES AND TROUBLESHOOTING WITH LIMITED STAFF
VALUABLE INFLIGHT CALIBRATION DATA WITHIN THE MARS ENVIRONMENT
WERE OBTAINED BY ALL INSTRUMENTS
DATA RELEASE PROCEDURES FOR PUBLIC OUTREACH/SCIENCE
PUBLICATION EXERCISED
INITIATED DATA ARCHIVING PROCESS AND PDS INTERFACE

SUPPORT TO A/B-1 PROVIDED TO PROJECT WITH RAPID TURN AROUND BY TES, MOC, MAG/ER, RS, MHSA, ACCELEROMETER TEAM

TET-5

MSOP Readiness Review: Part I



MGS SCIENCE ACTIVITIES FOR NEXT PERIOD

MGS SCIENCE SITE ACTIVITIES FOR THE NEXT SIX MONTHS INCLUDE:

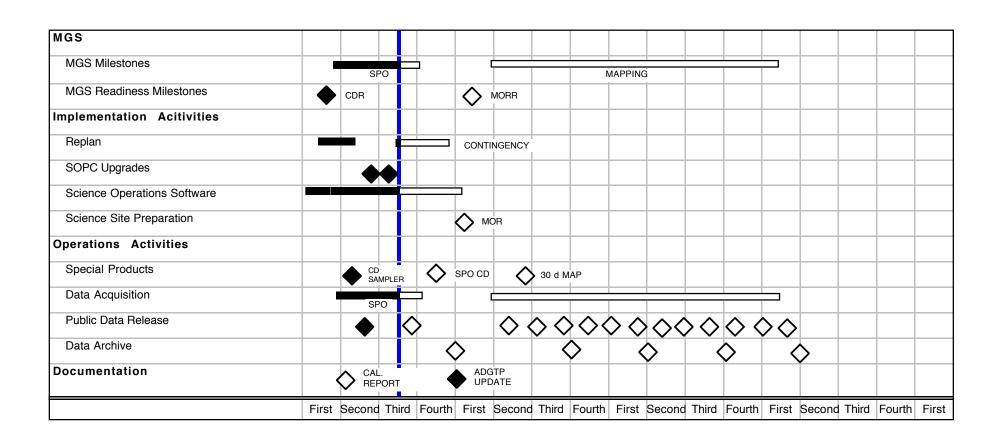
INSTRUMENT OPERATIONS SUPPORT (TES, MAG)
DATA ARCHIVE OF PRE-SPO AND SPO 1&2 DATA SETS TO PDS
PREPARATION FOR MAPPING

SOFTWARE FOR RAPID DATA SET PROCESSING
INSTALLATION OF FINAL WORKSTATION/DB CONFIGURATION
STAFF FINALIZATION FOR OPERATIONS
COMPLETION OF CALIBRATION REPORTS, DAILY PROCEDURES
PUBLICATION OF PRE-MAPPING RESULTS
VERIFICATION TESTS OF MAPPING GDS READINESS

MAPPING READINESS REVIEW WILL BE CONDUCTED AT EACH SITE PRIOR TO MSOP MAPPING READINESS REVIEW 2/99



MGS SCIENCE SCHEDULE





MGS SCIENCE OPERATIONS READINESS

SCIENCE TEAMS AND FACILITY ARE IN PLACE TO SUPPORT EVENTS OF THE FORTHCOMING PERIOD

EXTENSIVE EXPERIENCE DURING SPO HAS ENHANCED CAPABILITY TO SUPPORT ROUTINE OPERATIONS

LIMITED FLIGHT SCIENCE DATA ACQUISITION EXPECTED DURING THE NEXT PERIOD WILL REQUIRE MINIMUM SUPPORT

PREPARATIONS FOR MAPPING WILL BE VERIFIED BY MORR



M'98 FLIGHT SCIENCE EVENTS

MCO NEAR EARTH CALIBRATION L+ 4 TO 7 DAYS IS THE PRIMARY EARLY CRUISE SCIENCE ACTIVITY

MARCI: EARTH AND MOON POINTING, GEOMETRIC, PHOTOMETRIC DATA

PMIRRERADIATOR DOOR TO VENT POSITION

UHF: SIMULATED LANDER UPLINK FROM STANFORD OR ARECIBO

ORT FOR SEQUENCE: 11/02-11/19



M'98 SCIENCE FACILITY STATUS

SCIENCE FACILITY/OPERATIONS IMPLEMENTATION IS PROGRESSING

FACILITIES EXIST AND ALL HAVE SOPC + WS CONNECTIVITY READINESS TO BE ADDRESSED AT SITE MORRS

MARCI/MARDI - MSSS - SEPT. 22, 1998

MVACS - UCLA - SEPT. 29, 1998

PMIRR - JPL - OCT. 2, 1998

EOP STILL IN NEGOTIATION, OPERATIONS PARTICIPATION TBD LIMITED WORK IN PROGRESS FOR NEAR EARTH CALIBRATION LIDAR SUPPORT HAS BEEN ADDRESSED AT I/F MEETINGS AND BY NASA INTERNET TESTING

READINESS TO BE REPORTED AT MSOP READINESS REVIEW PART 2



M'98 CRUISE SCIENCE READINESS REVIEW

CRUISE SOFTWARE IMPLEMENTATION STATUS

ATLO results: instrument/S/C anomalies, remote interface results Instrument (flight) Software: uplink patches, changes from ATLO

Operations Software: sequence/SASF status, health reporting, telemetry processing

Data Processing software:instrument checkout, calibration database

ORT and Cruise sequence preparation

Configuration Control: change procedure, version ID, sw accounting

GDS INTERFACE

GDS Launch Version testing experience to date

Sequence Tool status: NAIF/SPICE, APGEN, DMD, sequence generation

SOPC/peripheral status

OPERATIONS INTERFACE

Sequence generation experience to date

ORT training preparation

OIA/SIS Status

OPERATIONS SITE STAFFING PROFILE

Key personnel: SOPC, instrument health, security, configuration control

Support personnel, Co-I/TM/PS roles, sw development/mapping preparation

Science Test and Training Plan Certification/PDB access

DOCUMENTATION STATUS

EOP status

Operations Facility Configuration Control Plan updates

SSD/UG (flight Instrument, ground operations), Calibration Report preparation (due 4/99)

Archive Plan Status

Descent/Mapping preparation

Schedule for landed ops/mapping HW/SW implementation

Resource status and staffing profile (EOP)

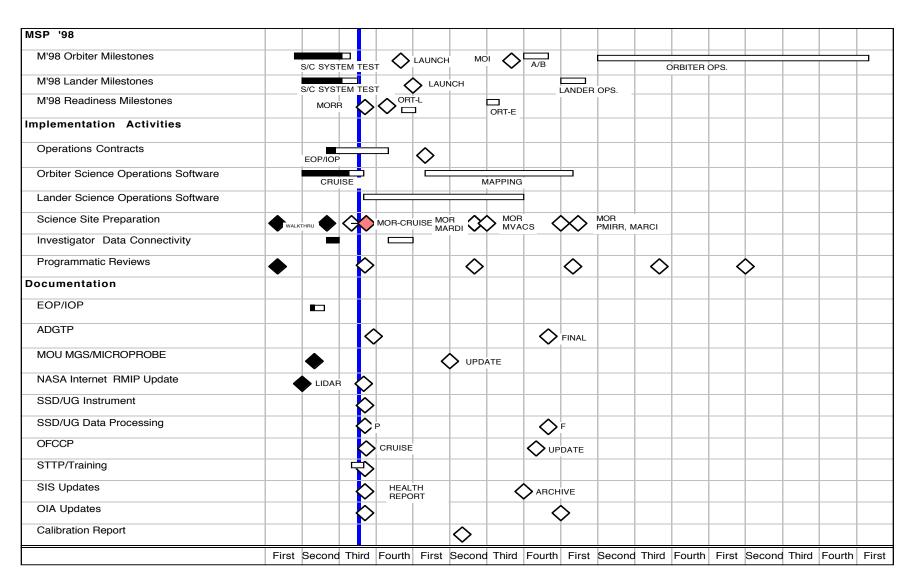
TET-11

MSOP Readiness Review: Part I

8/26-27/98



M'98 SCIENCE SCHEDULE





M'98 SCIENCE OPERATIONS READINESS

PMIRR: MO PREPARATION/CRUISE (1 HR FLIGHT DATA); OPERATION IS

IDENTICAL TO MOINSTRUMENT, MUST ADAPT CMD SYSTEM TO MSOP

MCO FILE LOADS

KEY PEOPLE: SCHOFIELD, ZUREK, GAISER

MARCI/MARDI: ON-GOING MGS/MSOP EXPERIENCE, FACILITY ALREADY IN

OPERATION, SOPC IN USE, OPERATIONS STAFFED

KEY PEOPLE: CAPLINGER, WARREN, JENSEN

MVACS: FINISHING FACILITY, SOME MPF EXPERIENCE, CO-LOCATED CO-I's

KEY PEOPLE: HANSEN, MCEWAN, MCBRIDE

LIDAR: SEVERAL I/F MTGS HELD, NI TESTING IKI LINK, UCLA WILL

ACCOMMODATE OPERATIONS PERSONNEL, SIMPLE INSTRUMENT

OPERATIONS, MICROPHONE I/F TBD

KEY PEOPLE: LINKIN, LIPATOV, HYDER